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VIEWS, NEWS AND INTERVIEWS.

The auxiliary cruiser "Yankee," which is manned by the New York Naval Militia, includes in her crew a large number of electrical men. During the "Yankee's" recent visit to New York, shore leave was granted to the crew for the first time since they joined the ship. An ELECTRICAL REVIEW man talked with one of the crew, who is well known in the electrical field. He is a little fellow, physically, but a "scrapper" of the scrappiest kind. He is also known to be particular about his personal appearance in times of peace, and is always correctly attired and well groomed. When he got his shore leave he made a break for the office of a friend and begged him to buy him "eleven gin fizzes, all at once." He had no money, and explained that nearly all the boys were in debt to Uncle Sam for their clothes and outfit. He was as brown as a berry, had a stubbly growth of beard, his hands were terribly begrimed and about the size of small hams, his muscles were as hard as iron, and he walked limpingly.

"Are you lame?" asked his friend.

"Not a bit, but these dern shoes bother my feet. I've been going barefoot ever since I've been sailorizing, and I guess my feet have spread out some," was the reply.

"Why didn't you wash your hands before you came ashore?" was the next shot.

"Wash my hands, you idiot! I did wash 'em and they're clean, too," said the sailorman, as he exhibited a pair of paws that would have shamed a coal-heaver.

"How do you like your job?" inquired the kind friend.

"Like it? Well, I've got to like it, that's all. Say, did you ever hear of a word called 'work'? Well, here's one little boy that fully understands what it means, and don't you forget it."

"Sir, explain yourself! This is almost too much!" dramatically commented the friend.

"Is that so? Well, here's a sample. When we were down at Key West, the ship lay about three miles from the landing. We do not possess that luxury known as a steam launch, so all trips to shore had to be made in a pulling boat. I happen to be one of a whale-boat's crew, and we had to make eight trips in one day between the ship and shore. That was three miles in, three out, eight times. I make it 48 miles—Key West—hot sun—sore hands—" and a painful reminiscent look took possession of the sailor's copper-colored countenance.

"But there are funny things in spite of the hard work," he went on briskly. "We were out at sea and one of the boys—you know him—was doing his trick at the wheel. Commander Brownson came up alongside him and, after watching him a few minutes, said:

"'You steer very well, my man.'

"Billy just saluted—being up on naval etiquette.

"'Been practicing since you joined the ship?' asked Brownson.

"'No, sir; I haven't been practicing much,' said Billy.

"'Well, you handle this ship as if you'd steered before,' said Brownson.

"'Yes, sir,' said Billy, 'I have.'

"'Where?' says Brownson.

"'All along the Atlantic coast,' says Billy.

"'What did you steer?" says Brownson.

"'My own steam yacht, sir,' says Billy.

"'How big is she?' says Brownson, after a pause.

"'About a thousand tons, sir,' says Billy.

"'I— I see,' says Brownson.

"'Thank'ee, sir,' says Billy, saluting.

"And the 'old man' went to his stateroom."

Marie Snooks. Luella Beideman. Margaret Buckland.

Flora Rice. Tealie Buckland. Margaret Kemmerer. Bessie Allen.

WOMEN STREET-CAR CONDUCTORS AT CHILLICOTHE, OHIO.

At Doylestown, Pa., the other night, an "electric light" sale of cattle was held. This is believed to be the first time the electric light has been used to show the fine points of stock.

The Metropolitan Street Railway Company, of New York city, will sustain a loss of $6,000 a day during the time the Sixth avenue horse cars are suspended while the underground electric system is being installed.

Since Commodore Schley "bottled up" Cervera's fleet in Santiago Harbor, the "bottling-up" process has become popular in many ways. A man in New York the other day got "bottled up" in a sound-proof booth at a telephone pay station. A carpenter had to remove the side of the booth to rescue the man, who was badly in need of fresh air.

WOMEN STREET-CAR CONDUCTORS.

A SUCCESSFUL EXPERIMENT AT CHILLICOTHE, OHIO.

The experiment undertaken on June 13, when the Chillicothe, Ohio, Electric Street Railway Company installed seven young ladies as conductors on their cars, has been fairly tested, and has proved a greater success than the management of the road had dared to hope it would. That such an innovation was tried was the result of a peculiar combination of circumstances. It was found that a great many people were riding on the cars without depositing a nickel in the boxes provided to receive the fares. It was also found that the receipts of the road would not justify the employment of conductors at the wages usually paid those functionaries, although conductors were manifestly needed. While the management of the road was vainly endeavoring to find a way out of this dilemma, the superintendent, Mr. Joseph P. Myers, suggested that young ladies be employed, as they would be willing to work for less money and, on a small line like that at Chillicothe, could probably do the work equally as well as men.

In answer to an advertisement inserted in a local paper over 100 women applied for positions. From these, seven were carefully selected. They are all of good family and of personal attractiveness, and since they have undertaken the work have found few unpleasant features connected with it. They receive $4 per week, are on duty nine hours a day, and have one day off in every week. They claim that the work is much to be preferred to any of the indoor occupations open to women. They have adopted a neat and serviceable uniform.

The management of the road has also good reason to be pleased with the experiment. Since the new conductors were placed on the cars, the receipts of the road from fares have increased an average of 30 per cent. The cars have been run on time and the young ladies have attended to the duties of their position faithfully

and well. The interest which has been taken in the experiment by superintendents of roads in towns the size of Chillicothe, where the same conditions have had to be met, is significant, and it is believed that within a very short time women conductors will be introduced in a number of other places. Many inquiries from other superintendents have been received as to the success of the experiment.

The introduction of women as conductors has been decried in some quarters for the reason that it was alleged they were supplanting men and their employment tended to the lowering of wages. These objections do not apply to Chillicothe, however, as the women supplanted nobody, it being a case of women conductors or none at all. As to the wages, they are fully as high, if not higher, than those paid to women in many other branches of industry.

The Man in the Hole.

A daily paper tells a story about a "pole affair" in Montclair, N. J., where the North Jersey Street Railway Company is meeting opposition in constructing the trolley road through that town. About nine o'clock the other morning a hole was dug in front of Louis Lang's house in Bloomfield avenue, where one of the trolley poles was to be erected. Mr. Lang protested, but was ignored by the workmen. Then he offered George Van Riper $1 an hour to jump into the hole and thus prevent the erection of the pole. Van Riper hesitated.

"Jump in, quick," shouted Mr. Lang; "$1 an hour and board."

Van Riper accepted this and swung himself into the hole. The construction boss coaxed and threatened him, but all to no purpose. At noon Mr. Lang ordered dinner, and, in the center of a large crowd which surrounded the excavation, Van Riper ate heartily. Then he drank a bottle of claret, while the crowd laughed and cheered. About three o'clock Van Riper was approached by the boss of the construction gang, who offered him $5 if he would get out of the hole. Van Riper replied that he had already earned $6 from Mr. Lang. A $10 bill was then offered, and this brought Van Riper to terms. He seized the bill, and as he sprang out of the hole the iron pole was put in place. In 10 minutes it was cemented solidly in the ground. Van Riper then sought Mr. Lang to get his $6, claiming that there was no agreement as to how long he was to stay in the excavation. Mr. Lang refused to pay.

Laying Cables at 20 Knots an Hour.

Lieut. William C. Crutchley and Mr. C. Scott Snell have devised apparatus by means of which a submarine cable can safely be laid at any rate of speed within the compass of the fastest cruiser, according to the London *Daily News*. This is very far in excess of anything which has hitherto been accomplished, but there is little doubt that the plan is feasible. The apparatus is capable of being fitted to a war ship or a properly equipped telegraph ship, or, as an alternative, there is a temporary arrangement which is capable of being adapted to any vessel at very short notice.

A pulley at the stern of the ship ejects the cable overboard and is driven by a motor. Beyond this stern pulley is a wide drum, over which the cable passes on its way from the hold. In conjunction with the drum is maintained 2,000 feet of cable under a constant tension.

The idea of a cable running out at 20 knots is rather startling, but experts are of the opinion that this could be accomplished. The inventors have devised an apparatus for holding it in hand, and completely stowing 2,000 cubic feet of cable, called the "cable accumulator" (a small unit-system of carrying the cable, which consists in placing the cable on board in drums of 40 knots capacity, and arranging them in columns, from which the cable is drawn off alternately), an "automatic traveler" to receive the cable as it leaves the drum, and finally a controlling system whereby an officer located in a chart-room keeps the attendant at the ejecting engine aware of the needed paying-out speed.

Sir George Clarke has remarked that there are about 38 cable ships in the world, and of these not more than four or five are under a foreign flag. Thus, we have almost a monopoly of trained men and of fitting appliances for laying and cutting cables. "If it were our policy," he remarked, "we could cut cables with greater certainty and more quickly than any other power. At the same time we could produce in England something like 2,000 knots of cable a month, and that rate could be maintained if the supply of gutta-percha would hold out."

The fact of being able to establish such communication at the fastest speed yet attained by a war ship would be of material value to a naval commander in working out a combination of effective force.

Moreover, a cable in war time could be laid in a very short time between two fixed points, and the navy which could lay a cable at full speed where none is shown to exist, and which, consequently, would not be searched for and destroyed by an enemy, would reap the full benefit when the necessity for establishing telegraphic communication arose.

ELECTRIC LIGHT FLASHES.

The Southern California Power Company is reported to have bought the plant of the San Bernardino, Cal., Gas Company.

The General Electric Company, of Minneapolis, has the contract to furnish a 1,200-light incandescent dynamo for the village of Hibbing, Minn.

The Bellingham Bay Improvement Company will rebuild the electric light plant at New Whatcom, Wash., immediately. A new location has been selected.

Cape Grisnez, on the French coast, opposite Dover, is to have a new electric light that will be visible 48 miles off. It will be of 3,000,000 candle-power, and is expected to pierce fog a distance of 16 miles. It will give out a white flash.

The earnings for June of the Edison Electric Illuminating Company of New York were as follows:

	1898.	1897.	Increase.
Gross.....	$215,155 92	$172,860 72	$42,295 20
Net	79,435 44	63,205 26	16,230 18
Gross, six months...	$1,541,722 96	$1,228,766 81	$312,956 65
Net, six months....	685,207 77	571,714 52	113,493 25

At a meeting of the Rich Hill, Mo., Water, Light and Fuel Company the following directors were chosen to serve the ensuing year: Capt. John Keiser, St. Louis; F. W. Stumpe, Washington, Mo.; W. R. Donaldson, St. Louis; Wm. C. Little, St. Louis; Claud Kilpatrick, St. Louis.

The contract for lighting the cathedral at Baltimore, Md., with electricity has been awarded to the Northern Electric Company, J. Frank Morrison, general manager. Between 600 and 700 lights will be placed in the building, superseding gas. It is expected that the new system of lighting will be in use in about two weeks.

At the annual meeting of the Middletown, Ct., Electric Light Company the following directors were chosen for the ensuing year: D. W. Northrop, William T. Elmer, William H. Burrows, Horace R. Butler, James P. Stow, Henry Woodward and H. L. Mansfield. The directors elected the following officers: D. Ward Northrop, president, and H. L. Mansfield, secretary and treasurer.

At the annual meeting of the Denton, Tex., Water, Light and Power Company the following officers and directors were elected for the ensuing year: T. J. Oliver, president; J. P. Blount, vice-president; A. F. Evers, secretary; H. F. Schweer, treasurer; H. C. Storrie, general manager. Directors: T. J. Oliver, J. P. Blount, A. F. Evers, H. F. Schweer, H. C. Storrie, R. C. Storrie and A. R. Hann.

The Westinghouse Electric and Manufacturing Company has just completed the electric installation of the Lyman mills, at Holyoke, Mass., which employ 1,500 hands. Included in the order is a 250 kilowatt, 440-volt, two phase generator, with 3,600 alternations, connected direct to an Allis engine, and six Westinghouse motors of from 36 to 75 horsepower each. These will be used to run spinning frames, looms and the machine shop.

The work of erecting the superstructure of the Smith-Moffatt electric power plant at Goldfield, Colo., will be started within a few days it is reported, and will be completed inside of three months. The cost of the works will be $150,000. It will be one of the largest, if not the largest, electric power plant in the state, and will be capable of generating electricity equal to 2,000 horse-power. Two large engines and two immense dynamos will be installed in the building, which is 100 by 90 feet.

The Patent Office Report.

Commissioner of Patents Deuel has submitted his annual report to the Secretary of the Interior for the year ended June 30 last. In that time 40,196 applications for letters patent were received, 1,831 applications for design patents, 93 for reissue patents, 1,891 for the registration of trademarks, 175 for the registration of labels, 30 for registration of prints, and 1,928 caveats. Patents were granted to the number of 22,731, including reissues and designs, and 1,455 trade-marks, 71 labels and 18 prints were registered. During the year 14,167 letters patent expired. The receipts of the office amounted to $1,253,948 and the expenditures were $1,081,633, leaving a surplus of $172,-3.4. The number of applications awaiting action is 12,187. The commissioner believes that the efficiency of the force will be greatly increased by the additional clerks authorized by Congress. He deplores the frequent resignations of members of the examining corps, as their places are hard to fill.

INTERESTING TELEPHONE DECISIONS.

THE CASE OF SIMON STERNE AGAINST THE NEW YORK TELEPHONE COMPANY.

The New York Supreme Court, through Judge Kellogg, handed down on July 18 two decisions in the suit of Simon Sterne against the New York Telephone Company, which practically leave Mr. Sterne without any case against that company. It will be remembered that some years ago, when the Metropolitan Telephone Company, of New York city, reconstructed its system and made metallic circuit working the rule. Mr. Sterne refused to allow his telephone line and instruments to be changed to metallic circuit, and when the telephone company proceeded to act upon its right to terminate its contract with Mr. Sterne, the latter secured an injunction restraining the company from interrupting his telephone service, and brought suit to compel it to furnish him service at a rate to be fixed by the court. The injunction was continued pending the trial of the suit, the Metropolitan company being authorized to change Mr. Sterne's line and instruments to metallic circuit, and he giving a bond to pay the full rate in the event of the case going against him.

Some time later the Metropolitan Telephone and Telegraph Company went out of business and sold its plant to the New York Telephone Company, a concern organized to furnish telephone service in a much larger area than that served by the Metropolitan company. Mr. Sterne subsequently secured an order to bring in the New York Telephone Company as defendant, and it was to that company's motion to vacate the order that one of Judge Kellogg's decisions referred. The decision states that this was the first opportunity the New York Telephone Company had to be heard in the matter, and that company had the right to expect that its present motion would be considered unprejudiced by any previous determination of the court in its absence. "The order and the supplemental complaint obviously regard this defendant as a corporate body, separate and distinct from the other defendant. It is not the same body under a new name or changed name. It must be regarded as having no legal relations with the other defendant or with the acts of the other defendant except those created by contract with it." The decision points out that while Mr. Sterne alleged that the New York Telephone Company assumed all "debts, contracts and liabilities" binding upon the Metropolitan company, it is not alleged that there existed any contract with Sterne binding upon the Metropolitan company. Even construing "liabilities" as the alleged legal liability to furnish telephone service to the plaintiff, the case is no stronger, "for one can not make more binding his burden by declaring upon paper his intention to perform what the law directs. In no way can it be reasoned that this is a contract liability. If this defendant owes any duty to the plaintiff it is because the law imposes it." After stating that there is no precedent in support of any other contention, the opinion concludes as follows: "The law does not hold this defendant responsible for any alleged wrongful threats of the Metropolitan Telephone and Telegraph Company. That is the cause which enabled plaintiff to bring this action in a court of equity. The cause of action does not in law follow the property; the duty to furnish the service may; when a similar case arises against the new owners it may be held to answer, but I see no ground whatever for the contention that it must answer for the threats of its predecessor in ownership. The motion to vacate is therefore granted, with costs."

The second decision of Judge Kellogg relates to a motion to vacate an order permitting the examination of the officers and books of the Metropolitan Telephone Company to procure testimony, an order in which, by a supplemental complaint, it was sought to bring the New York Telephone Company as successors. The motion to vacate was granted for much the same reasons as those given in the previous opinion. The original defendant has gone out of business, and no issue remains between it and the plaintiff. There was no contract between them, and the defendant, therefore, can owe the plaintiff nothing, and does not seek to recover anything. The relief sought by the action is now impossible. The decision goes on: "By the supplemental complaint the plaintiff seeks to create a living issue with the defendant, the New York Telephone Company, to obtain a substantial judgment; viz.: The judgment he originally claimed against the Metropolitan Telephone and Telegraph Company on the ground that it has succeeded to the property and duties of the last-named company. The fact that plaintiff by order of the court deemed it necessary to bring in this party as a defendant is a sufficient admission that it has a separate entity and is to be treated as a separate and distinct party; as a new party it has a right to be heard on all motions affecting trial, and especially in motions to examine books and officers to procure testimony to be used at the trial. The order here sought to be vacated as to this defendant is a nullity. The testimony procured under this order could not be read at the trial under any issue formed with the supplemental complaint, and for that reason, in my judgment, the order should be vacated. If the Court of Equity will exercise the right to fix in advance the annual rentals of telephones at the instance of an individual desiring to have his premises equipped with these mechanical facilities, it will fix such rental on a basis of reasonable profits to the company or individual directed to render such service, and this necessarily involves an inquiry into the affairs and business of that particular company or individual. The books of any other company or individual are not competent evidence on such an inquiry, they are not admissions to the party, and possess no higher grade in testimony than hearsay. For such reason the testimony sought by this order, even though the order were made on notice, could not be made available as against the New York Telephone Company. I am of the opinion that the order should be vacated, with costs, and it is so directed."

Electric Lighting at Balmoral Castle.

Balmoral Castle is to be lighted by electricity generated by water-power at the upper part of the Gelderburn, about one and one-half miles from the castle, says London *Engineering*. Provision is being made for two Gilkes vortex turbines, which, with a fall of nearly 80 feet, will give 80 horse-power combined. This power will be utilized in driving the dynamos for charging a large battery of accumulators at the castle, and also for lighting the lamps direct. The current will be transmitted by large cables laid underground all the way. The electric light will at first be limited to the Queen's private apartments, the ball-room, and a few of the principal rooms in the castle, and the installation is expected to be in working order by the time Her Majesty returns to the North next month. Eventually more than 600 lights will be installed in the castle alone, but if electric lighting is extended to the stables and outbuildings, about 1,000 lights will be required.

The Production of Electrolytic Copper at Perth Amboy, N. J.

The development of electrolytic processes for the production of refined copper has proceeded very rapidly during the past three years, and at the present time a very large proportion of all the refined copper is thus produced. The Westinghouse Electric and Manufacturing Company have installed a very large amount of apparatus for this class of service. One of the principal installations is at the refinery of the Anaconda Copper Company, Anaconda, Mont., where 10 generators of 270 to 300 kilowatts capacity have been installed. Another very large installation is that of the Boston & Montana Consolidated Copper and Silver Mining Company, Great Falls, Mont., where two 810-kilowatt Westinghouse engine-type generators are in service.

The latest comer in this field is the Raritan Copper Works, of Perth Amboy, N. J., who are about to erect the largest copper refinery in the East. They have contracted with the Westinghouse Electric and Manufacturing Company for three 600-kilowatt, 150-volt engine-type generators, 150 revolutions per minute, with a nine-section switchboard for electrolytic service and the operation of two 75-kilowatt, 220-volt engine-type generators, which will be used for lighting and power service. The installation, it is said, will be the most complete of its kind in the world.

Electricity, Compressed Air and Steam in Mining.

In a prize essay Mr. G. E. J. McMurtrie, an English engineer, sums up as follows the comparative advantages and disadvantages of steam, compressed air and electricity for power purposes in coal working, with special reference to coal cutting and haulage:

"The author has now considered steam, compressed air and electricity for haulage, pumping and coal cutting purposes.

"He has endeavored to show that while, probably, rope haulage driven by a steam engine at surface, and also rope haulage driven by a steam engine below, with the steam taken down the pit, are more economical than similar plants driven by either compressed air or electricity, yet that, when the time has arrived for the haulage to be extended, and for subsidiary engines to be put down inby, electricity and compressed air only can be used.

"Also that, of the two, electricity, on account of both its greater efficiency and its reduced first cost, is then to be preferred.

"For similar and other reasons he has considered that electricity should be adopted for both pumping and coal cutting."

MECHANICAL DRAUGHT.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, JUNE 13, 1898, BY WALTER B. SNOW.

The substitution of the fan for the chimney as a means of draught production marks a distinct advance in the convenience and economy of steam generation. It is, therefore, fair to assume that a discussion of mechanical draught must be of particular interest to all who are concerned in central station management. Although the advantages of many improvements are to be viewed solely in their direct commercial relation, such is not the case with mechanical draught. Not only does its application insure an evident economic gain, but in both its installation and operation there are certain conveniences which are to be considered as distinct advantages, although it may be almost impossible to determine their definite economic values.

Mechanical draught may, in stationary practice, be applied in either of two ways: First, by forcing the air into a closed ashpit and maintaining therein a pressure in excess of the atmosphere; and second, by exhausting the air and gases from the flue or uptake, and thereby creating a partial vacuum which causes a constant inward flow of air in the combustion chamber. The former is designated as "forced draught" and the latter as "induced draught." Under certain conditions a combination of the two methods may be found desirable. The natural result of the application of a centrifugal fan in either manner is to render the draught conditions positive at all times. A fan of the disk or propeller type is entirely inadequate for such work.

On the erection of a chimney the first matter to receive consideration is the foundation. This always represents a comparatively large and, in the case of unstable ground, an abnormally excessive proportion of the expense of the entire structure. A fan, on the other hand, is relatively light, requires no expensive foundation, and may, in many cases, be located upon the top of the boilers. Not only does this vastly reduce the cost of installation, but it furthermore lessens the space required, which is always a definite character in the case of the chimney, but with a fan placed overhead is entirely eliminated.

The portable character of a mechanical draught apparatus renders it not only valuable as an available asset, when it is no longer required in a given location, but makes possible its relocation or arrangement in a manner that is absolutely impossible in the case of a chimney, which must always stand as a monument to a departed industry or an abandoned means of draught production.

The primary duty of the chimney is to create sufficient draught, while its secondary office is to remove the gases and smoke to a proper height for discharge to the atmosphere. The height required for this purpose is almost universally less than that necessary to produce the draught. Obviously, a stack of decreased height and cost will serve the purpose with mechanical draught. In fact, a sheet iron pipe extending but a few feet above the top of the boiler house will, in most cases, fulfill the requirements.

The steel plate construction which is common to most fans employed for producing draught makes it possible to readily design and build them to exactly suit any given conditions. Such a fan may be arranged to be driven by a belt or by a direct-connected engine, as may be desired, may be automatically controlled in its speed to meet the requirements of steam generation, and may be increased in capacity by the simple transmission of more power.

In operation, mechanical draught is both positive and flexible. Its positive character renders its action independent of the weather and its flexibility lends to it that characteristic so lacking in the chimney, the ability to exactly adapt the intensity of the draught as well as the volume of air to the existing requirements. How much those two elements of simple convenience mean in the generation of steam for electric traction work can only be realized by one who has experienced the sudden and immense fluctuations incident to such service. The fan is always at its best, can be instantaneously pushed to its utmost and does not have to wait for hotter fire to produce stronger draught. When properly installed, such a fan should be provided with an engine devoted solely to its driving, and the speed of this engine should be so controlled by devices that are readily applied, as to increase its speed in proportion as the steam pressure falls. It is thus possible under all ordinary conditions to maintain practically constant steam pressure and to insure immediate response to sudden demands.

Notwithstanding the immense heat losses incident to the use of a chimney, and the discharge of the waste gases at a sufficiently high temperature to create the requisite draught, the engineering public has been comparatively slow in availing itself of the advantages of some form of heat abstractor by which, at least, a portion of this loss can be prevented. The reason is evident in the fact that the increased resistance thus introduced and the lower temperature of the escaping gases necessitate a chimney of considerably greater height to produce the same draught. The fan, however, lends itself most admirably to introduction under these conditions. The very factors that operate against the chimney are distinctly advantageous to the fan, if of the induced type, for the lower the temperature of the gases the smaller the fan and the less the speed to produce the same results.

Another feature of convenience resulting from the employment of mechanical draught is to be found in the ability to burn cheap fuels, which are almost invariably of small size and require an intensity of draught which is not readily created by means of a chimney. The economic value of this and the preceding features of convenience will be considered as we proceed.

The "smoke nuisance" is in many of our communities receiving the attention that it properly deserves. In practically all devices which have proved successful in the prevention of smoke, improved draught has been a most important factor, and the positiveness and intensity of the draught produced by a fan have assured the success which has attended its application.

We may now turn to the distinctly economic aspects of the installation of mechanical draught, and, of necessity, these must be considered relatively to those incident to the use of a chimney. Employed solely as a means of creating air movement, the chimney is most absurdly inefficient. It may be readily shown that, under the ordinary conditions of boiler practice, an engine-driven fan will move a given amount of air with the expenditure of about one-seventy fifth as much power. This immense advantage of the fan over the chimney may be turned to good account by introducing proper devices for transferring the heat of the gases to the feed-water or to the air supplied to the fire, and the gases may, with fan draught, be cooled to a temperature far below that which could be attained with a chimney, without too seriously reducing its draught. Tests of nine large boiler plants, equipped with economizers and mechanical draught, are reported by Roney to have shown on an average saving of about 14 per cent; in consideration of the omission of the chimney this may show a handsome return on the investment. In connection with a plant of such size the steam required for the operation of the fan, with an efficient engine, be kept within one per cent of that generated by the boilers to which it is applied.

Custom and the expense of high chimneys are, doubtless, responsible for the comparatively low combustion rates which prevail in most steam plants. It may be fairly stated that to double the rate of combustion on a given grate area, it is necessary to make the chimney about three times as high, at a cost, perhaps, five times as great. In the case of a fan, the same result could be obtained without even so much as doubling the cost. This clearly points to the economy to be secured by properly designing the boilers, increasing the combustion rate and securing a greater output from a given size boiler and for a stated investment. Low combustion and evaporation rates are not essential to high efficiency. Within reasonable limits, the higher the rate of combustion, the less is the volume of air required per pound of coal. The fire is of necessity deeper, the draught is stronger, and each individual particle of air has increased opportunity to come in contact with the fuel. With a decreased supply of air the intensity of the fire is increased, its temperature is higher, more heat is radiated to the exposed boiler surfaces and more is taken up by the gases, which, because of less ultimate volume, move at lower velocity and thus have more time to part with their heat. As regards the economy of various rates of evaporation, F. R. Low has shown that in the case of 30 Babcock & Wilcox boilers practically as good results were obtained at a rate of 1.5 pounds per square foot of heating surface as at the rate of 1.75 pounds.

When a fan is employed as a means of draught production, it may, at comparatively small expense, be installed of such size as to possess a potential capacity which, if embodied in the boilers, could only be provided at vastly greater first cost with incident larger fixed charges.

In order that a definite comparison may be made between the two methods of draught production, a certain 1,600 horse-power plant has been taken, of which the cost is known. This consists of eight modern water-tube boilers, two economizers and a chimney eight feet in diameter by 180 feet high. The latter is located just outside the boiler-house wall. If a duplex induced mechanical draught apparatus, each fan capable of operating the entire plant, should be substituted for the chimney it could be placed immediately above the economizers, and with its attached engine could be rigidly supported by beams resting on the economizer walls. A short stack would serve to discharge the gases above the roof.

The cost of the chimney with damper regulator and dampers is $9,300; that of fans, engines, draught regulation and short stack, installed complete, would be about $3,500, or only 38 per cent of the draught-producing apparatus for which it is substituted. That is, the saving would be $5,800.

With the increased draught produced by the fans it would be possible to raise the combustion rate and the steaming capacity, or what is equivalent, the steam capacity might be maintained with a less number of boilers. Suppose one of the eight boilers be omitted from the original design, making the plant 1,400 nominal horse-power, a further saving of about $4,000 may thus be secured.

If the land be valuable, the reduction of space incident to the employment of mechanical draught may have an appreciable effect. If worth, say, $2 per square foot, the saving by omission of chimney and one boiler would be about $2,000. The total saving in first cost, resulting from an expenditure of $3,500 for mechanical draught, may thus be shown to be $11,800; that is, the saving is nearly three and one half times the expenditure necessary to secure it. Obviously there is a coincident reduction in the fixed charges for interest and taxes.

The power expenditure for oper-

ating the fans should be practically inappreciable in any well designed plant, in which provision is made to utilize the exhaust steam from the fan engine.

The most direct saving in operating expense which may be secured by the introduction of mechanical draught is that resulting from the utilization of cheaper fuel. Such a plant as previously described would, under good conditions, probably require at least 8,000 tons of high-grade coal per year, operating 10 hours per day. If a saving of only 25 cents per ton could be effected, it would represent an aggregate of $2,000 per year, a pretty good return on an investment of $3,500. But in many cases a much greater saving may be brought about. A case in point is that of the United States Cotton Company at Central Falls, R. I., where, with a 1,000 horse-power boiler plant, the fuel originally employed with chimney draught was George's Creek, Cumberland, costing $4 per ton. With forced draught, a mixture of No. 2 buckwheat screenings and Cumberland is now used, costing $2.62 per ton. The saving has been about $125 per week, enough to pay for the special steam fan in about six weeks.

Other direct and indirect advantages of mechanical draught might be presented, but the limits of the paper will not permit. If it were not for its rough and ready character, the chimney would long ago have been discarded, because of its wastefulness. In the search for the highest efficiency such waste can no longer be ignored, and when dollars and cents are concerned, crude methods must give way to those of greater refinement. It is for this reason that the most progressive engineers of the present day are not only considering, but adopting mechanical draught as a substitute for the chimney.

Pottery Produced Electrically.

An English firm has developed an electric process for the production of ceramic wares which is stated to produce a very superior product. Photography is employed to produce the designs, and the electric furnace for burning. After the photograph has been applied to the material the photograph is put under a specially prepared glaze and burnt in. A great deal of the beauty and success of the system depends upon the use of the electric furnace, due to the regulation of its high temperatures. A representative of a London electrical paper, who examined several specimens of this ware, pronounced them excellent, and gave his opinion that the process can be applied to all kinds of ware with commercial success, as it is not costly.

The Fenton, Mich., electric light plant has been sold to Rev. F. S. Thompson for $3,000.

The Bullock-Willans Central-Valve Engine.

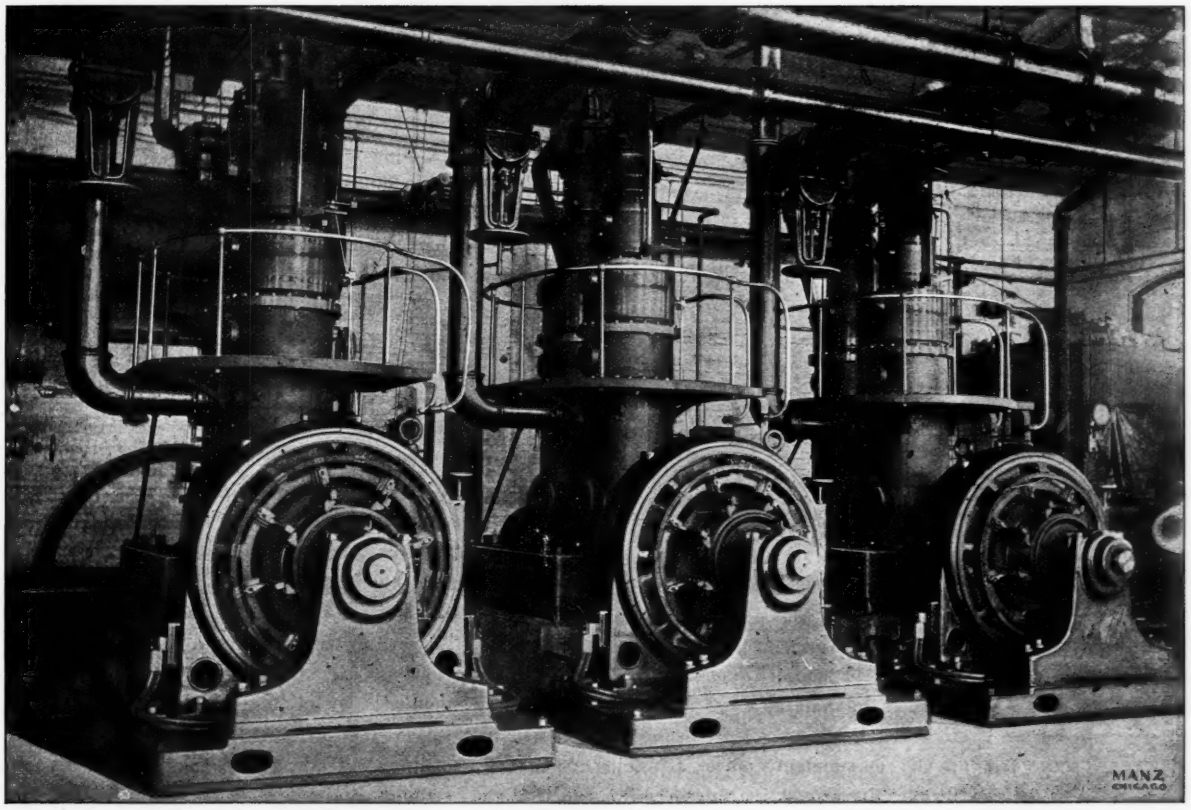
The M. C. Bullock Manufacturing Company, 1170 West Lake street, Chicago, are the manufacturers of the Bullock–Willans central-valve engine, an installation of which is depicted in the illustration on this page. The plant shown is one installed for the Nichols Chemical Company, of New York city. It consists of three triple-extension transfer condensing central-valve engines, which are direct-coupled to three 124-kilowatt Westinghouse dynamos. The units run at 380 revolutions a minute. The total space occupied by this plant is 24 feet 1 inch long by 13 feet 6 inches wide. The height of the engines over all, from the floor line, is 15 feet 8½ inches. The total indicated horse-power of the engines is 600 and the total kilowatts of the dynamos is 372.

The manufacturers state that an economy of less than 13 pounds of steam per indicated horse power per hour has been recorded under suitable circumstances of size and pressure. They say that a consumption of less than 14½ pounds can be guaranteed in engines of only 80 horse-power with 160 pounds steam pressure. The engines are single-acting, and there being no reversal of stress on bearings, all of the parts are always kept in constant thrust, thus insuring perfectly silent running.

In the electric light station at Bradford, England, 15 Willans engines, direct-coupled to Siemens dynamos, are in service. These are the same diameter of cylinder and length of stroke as those in the plant of the Nichols Chemical Company, illustrated herewith. One of the units at the Bradford plant was specified to give 300 indicated horse power, but is capable of giving 700 indicated horse-power continuously. The boiler pressure is 180 pounds per square inch, but the boilers can be worked up to 200 pounds if desired. At the trial of this unit the consumption of steam was as follows. It may be said that the poor vacuum was due to insufficiency of cooling water:

	Vacuum.	Revolutions per minute.	Consumption per 1 H.-P. per hour. Actual.	Guaranteed.
Full load	21 inch.	299	13 5	14
Half "	23 "	299	14 2	14.5
Quarter	24 "	300	15.0	15

The M. C. Bullock Manufacturing Company, of Chicago, are very proud of the yearly growth record of the Bullock–Willans central-valve engines. Over 200,000 horse-power are now in use or on order. The indicated horse-powers installed during the year 1891 were 11,000. The record for 1896 was 42,800 indicated horse-power.



BULLOCK–WILLANS CENTRAL–VALVE ENGINES DIRECT-CONNECTED TO WESTINGHOUSE DYNAMOS.

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]
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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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Owing to the frequency and severity of electric storms on Staten Island, that place has been described as a "natural electric storage concern." We believe Mr. Erastus Wiman is to be credited with inaugurating the electrical development of Staten Island, and perhaps he could tell us why its visitations from thunder and lightning are so numerous.

THE BROOKLYN NAVY YARD NEEDS A TROLLEY ROAD AND MORE TELEPHONES.

The need of a trolley railway at the Brooklyn Navy Yard has been thoroughly demonstrated during the last few months. When it became necessary to load colliers and supply ships rapidly at various points in the yard, the problem was solved by laying a temporary track and securing a steam locomotive from the Brooklyn Elevated Railroad Company. Flat cars were improvised, and this little, old-fashioned train has been in constant service ever since. There is a good electric light plant at the Brooklyn yard, whose capacity could be readily increased so as to furnish sufficient current to operate a trolley road. This should be installed at once, and the wonder is that the government has not seen fit to do it before. When ships are being repaired at the various dry-docks the use of the trolley road will save long and time-consuming journeys, for officers and men, between the docks and the various shops where materials and the special tools required have to be secured.

The telephone facilities of the Brooklyn Navy Yard should be improved, as they are totally insufficient to the traffic. The officers of a ship lying at any of the numerous berths or in the several docks at the yard now have to transact their telephone business by walking from their ship to the general storekeeper's office or to the commandant's office. It would seem that a trunk line might be run to a convenient center of distribution, and other lines run from there to terminal poles near the various docking points usually occupied by ships. It would then be a very simple matter for the electrician of each ship to connect with one of these lines a wall telephone, located either in the ward-room or in the captain's cabin. The officers of each vessel would then have instant communication with all parts of the yard, with the various naval bureaus in New York city, and with the Navy Department at Washington. It is certain that these two suggested improvements would greatly add to the efficiency and rapid conduct of business at the Brooklyn Navy Yard.

THE X RAYS IN WARFARE.

The army hospital ship "Relief" has proved to be one of the most valuable adjuncts to our forces in the Spanish war. Her unusually complete equipment has rendered it possible to care for the wounded and sick soldiers as well, if not better than they could have been cared for in a shore hospital. As already noted in the columns of the ELECTRICAL REVIEW the "Relief" is equipped with a complete X-ray outfit donated by the General Electric Company. This apparatus, it is now stated, must be credited with a large part of the success in performing operations on those soldiers dangerously wounded. In almost all the cases of complicated wounds the X-ray apparatus has been used to locate the bullet or to determine the nature of bone fracture, usually with a high degree of success. Seventy-five radiographs have been taken by Dr. W. M. Gray of the "Relief," and will be forwarded to Surgeon-General Sternberg at Washington. One of the most interesting of these radiographs traces the course of a bullet which struck a private in the region of the right elbow. The picture shows that its course was up the right arm, across the chest, and down the left arm, finally stopping in the left forearm, the bone of which it broke. The surgeons of the "Relief" are enthusiastic in praise of the aid rendered by the X-ray outfit. We believe that after this experience no nation will ever again go to war without equipping its army with one or more hospital ships and providing them with a full complement of X-ray apparatus.

WOMEN CAR CONDUCTORS.

We publish in this issue of the ELECTRICAL REVIEW an interesting account of the experiment at Chillicothe, Ohio, of operating electric street cars with women conductors. The reasons for the innovation are fully set forth. On Monday of this week a similar experiment was inaugurated at Vincennes, Ind., where five young women have undertaken the duties of conductor on the local street railway.

PERSONAL.

Mr. C. E. Trump, president of the Novelty Electric Company, came over from Philadelphia last week to enjoy a day in this Summer resort city. Mr. Trump visited Hartford before returning.

Mr. Macomber, senior assistant of the electrical engineering department of Sibley College, Cornell University, has been appointed professor of electrical engineering at Armour Institute, Chicago.

Mr. Arthur D. Newton, general manager of the Eddy Electric Manufacturing Company, of Windsor, Ct., was a New York visitor last week, conferring with his representative here, Mr. H. B. Coho.

Hon. Ferd. W. Peck, of Chicago, who was prominently identified with the World's Columbian Exposition of 1893, has been appointed Commissioner-General of the United States to the Paris Exposition of 1900.

Mr. James S. Healey, of the Julius Andrae & Sons Company, Milwaukee, has just returned home from a trip through southern Wisconsin in the interests of his firm. Mr. Healey reports trade exceptionally good in that section.

Mr. Walter Chappell, who recently graduated in the electrical department of the Ohio State University, is enjoying a visit with his parents, Mr. and Mrs. Theo. Chappell, of Barnesville, Ohio. He expects to locate in Chicago, where he has secured an excellent position as an electrician.—*Barnesville, Ohio, Enterprise.*

Mr. H. L. Shippy, secretary of John A. Roebling's Sons Company, a well known citizen of New York, left last week on his usual Summer visit to London, where business and rest will be dovetailed. Mr. Shippy is expected to return about September 1, to keep an outing engagement with his friend, Mr. James Kempster, of this city.

Mr. D. E. Goe, well known in electrical circles, has accepted the position of manager of the catalogue and advertising department of the Sprague Electric Company, succeeding Mr. A. G. Glover, who has retired. Mr. Goe was for a number of years engaged in electrical work in Chicago, and possesses special qualifications for producing artistic and impressive printing.

Mr. Chas. E. Dustin, of Hartford, Ct., has accepted the presidency of the Excelsior Electric Company, of New York, succeeding Mr. H. D.

Fuller, who has retired to look after his extensive interests outside the electrical field. Mr. Dustin was one of the first to enter the business of electrical manufacture, and his experience and energy are sure to rapidly advance the interests of the Excelsior company, which is one of the pioneer electrical manufacturing companies of the United States.

LATE NEWS.

The large car barn of the Penn avenue branch of the Consolidated Traction Company, of Pittsburgh, was destroyed by fire on July 24. The building and 40 cars were burned. The loss is estimated at $150,000.

At the annual meeting of the stockholders of the Wilmington City, Del., Railway Company the following directors were re elected: C. W. Clark, S. W. Colon, Jr., Preston Lea, E. W. Clark, Jr., C. Ford Stevens, W. W. Pusey and Thomas C. Barr.

A press dispatch from Cleveland, Ohio, says that the Walker Company, of that city, has just received one of the largest orders ever booked by the firm. It came from Paris, and is for the complete equipment for 500 electric street cars. This includes 1,000 motors, 1,000 controllers, 500 trolleys and minor apparatus. It is stated that the order will amount to more than $500,000.

The employés of the Metropolitan Street Railway Company, of New York city, have formed the Metropolitan Street Railway Association, a protective and benevolent organization, which has the approval of the company. The initiation fee is $1 and dues are 50 cents a month. Members in good standing will receive an allowance when incapacitated by sickness or accident.

The New York State Railroad Commissioners have given permission for the construction of three electric railroads in New York city. The Kingsbridge Railway Company will build a road from Manhattan street to Yonkers, over the Boulevard and Kingsbridge road. The North End Street Railway Company will operate a road from 130th street and the Boulevard over the Boulevard and Kingsbridge road to 145th street and over that street to the Harlem River. The Fort George & Eleventh Avenue Railroad Company will operate a road from the junction of the Kingsbridge road and the Boulevard over the Boulevard to 175th street. The first two companies will use but one set of tracks on that part of the Boulevard where the roads are coincident.

American Street Railway Association.

As already announced in the ELECTRICAL REVIEW, the next meeting of the American Street Railway Association will be held at Boston, September 6 to 9. The Hotel Brunswick will be headquarters. Papers will be read on the following subjects:

"Maintenance and Equipment of Electric Cars for Railways," by M. S. Hopkins, electrician, Columbus Street Railway Company, Columbus, Ohio.

"To What Extent Should Railway Companies Engage in the Amusement Business?" by W. S. Holmes, general manager, Metropolitan Street Railway Company, Kansas City, Mo.

"The Carrying of United States Mail Matter on Street Railways," by W. S. Dimmock, general superintendent, Omaha & Council Bluffs Railway and Bridge Company, Council Bluffs, Iowa.

"The Comparative Earnings and Economy of Operation Between Single and Double Truck Cars for City Use," by Richard McCulloch, electrical engineer, Cass Avenue and Citizens' Railway Company, St. Louis, Mo.

"Inspection and Testing of Motors and Car Equipment by Street Railway Companies," by Frederick B. Perkins, electrical engineer, Toledo Traction Company, Toledo, Ohio.

"Cost of Electric Power for Street Railways at Switchboard, Both Steam and Water," by R. W. Conant, electrical engineer, Boston Elevated Railway Company, Boston, Mass.

Wall Street and the Electrical Stock Market.

The market during the past week was characterized by the prevailing midsummer dullness, and dealings were on a very limited scale. The bond market has been quite active, especially since the closing of the subscriptions to the government loan. General Electric closed to-day at 39¼ as compared with 38⅜ a week ago. Western Union closed at 92½, showing a gain of ¼ point over the previous week. On the Boston exchange American Bell closed at 273 bid and 275 asked. General Electric preferred closed at 93 bid and 95 asked. On the Philadelphia exchange Electric Storage Battery common closed at 33¼ bid and 33¾ asked.

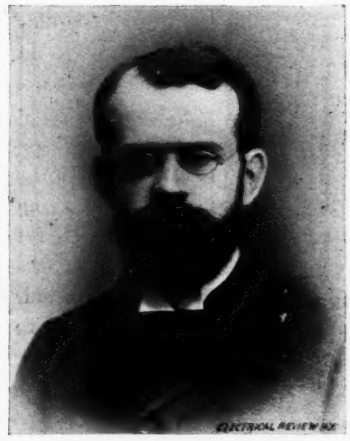
Wall Street, July 23.

At the annual meeting of the stockholders of the Ithaca, N. Y., Street Railway Company the following directors were elected: E. G. Wyckoff, E. L. Fuller, C Carpenter, Jared T. Newman, J. Mortimore, C. G. Hoyt. At a meeting of the directors the following officers were elected: E. G. Wyckoff, president; E. L. Fuller, vice-president; J. A. Mortimore, treasurer.

OBITUARY.

DEATH OF JOHN M. JACKSON

News has been received from Honolulu, Hawaii, by way of San Francisco, of the death of John Mason Jackson, of Chicago, who was for 25 years connected with the Western Electric Company. Mr. Jackson's body will be embalmed at Honolulu and brought to Chicago for burial. About six months ago Mr. Jackson went to Hawaii, in company with a friend, in search of health. He was suffering from nervous prostration brought on by overwork, and had nearly regained his health when he was stricken with diphtheria. In recent letters to his friends Mr. Jackson stated that his health was rapidly improving, and the news of his death came as a great shock. He was 39 years of age, and was treasurer of the Western Electric Company at the time of his death.



JOHN MASON JACKSON.

DEATH OF EDWARD DEXTER BROWN.

It is with deep regret that the ELECTRICAL REVIEW chronicles the death of Corp. Edward Dexter Brown, of Troop C, National Guard of New York. Mr. Brown was widely and well known in the electrical fraternity. Born at Reading, Mass., August 29, 1868, and educated in the public schools of that place, he entered the Massachusetts Institute of Technology, and was graduated in the class of '90 with the degree of Bachelor of Science. Shortly after graduation he entered the engineering department of the American Bell Telephone Company and distinguished himself while there by his fertility of ideas and close application to business.

In September, 1891, he entered the employ of the American Telephone and Telegraph Company (long distance company) as a special inspector, passing thereafter through the positions of New York manager, district inspector, to that of the general inspector, a position which he held at the time of his resignation to enter the service of the United States Government.

Mr. Brown was one of the most expert telephonists of his time and his personality will be recognized in many branches of the art for all time to come. His connection with various societies will be greatly missed. He was a member of the American Institute of Electrical Engineers, the M. I. T. Society of New York (a member of its executive committee), the Brooklyn Institute of Arts and Sciences, M. I. T. Alumni Association, Crescent Athletic Club, Brooklyn Reform Club, and president of the Telephone Society of New York.

In 1897 Mr. Brown enlisted in Troop C, National Guard State of New York, as a private. He volunteered on the first call, and was mustered into the service of the United States on May 22, 1898. He was made a corporal shortly before his troop left for Camp Alger.

On June 29 last he was stricken with typhoid fever and taken to the Post Hospital at Fort Meyer, where he died on July 2. He leaves a widowed mother, a brother and a sister.

George E. Bock, an electrical engineer in the employ of the Allegheny County Light Company, of Pittsburgh, was killed by electricity on the night of July 14. Although the rules of the station required the use of rubber gloves by employés when working around the switchboard, Mr. Bock neglected this precaution, and his bare hands came in contact with two switches at the same time. He received a heavy shock, and his death was almost instantaneous. He was an experienced employé, and how he came to neglect to use the rubber gloves is unknown. He was 25 years old and unmarried.

Electric Storm on Staten Island.

New York city and vicinity was visited by a severe electric storm last Thursday evening. The center of the storm seemed to be over Staten Island, where considerable damage was done. Lightning disabled a generator in the power-house of the Midland Railroad, and the trolley system was blocked for an hour. The electric lights at Midland and South beaches were extinguished, a converter in the ferry-house at St. George was burned out, and many telephone lines were blown down in several places on the island.

The Large Business of the Western Telephone Construction Company.

The Western Telephone Construction Company, of Chicago, is at present operating its factory night and day, employing something over 200 hands. Since the reorganization of the company its business has largely increased. The shipments for the month of July promise to be the largest in its history. During a period of 45 days, from July 1, it is announced that 32 complete telephone exchange equipments will be shipped from its factory, including the central office equipment of over 2,000 stations capacity for the Newark Telephone Company, of Newark, N. J. This is said to represent the most extraordinary output in the history of independent telephone manufacturers.

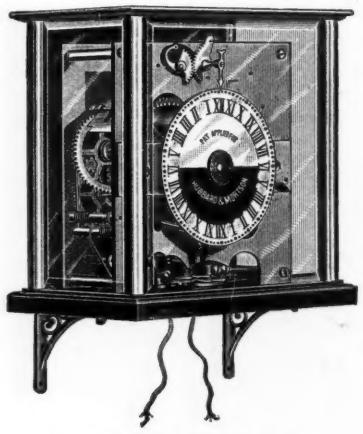
Following the reorganization of this company some differences arose between the stockholders, one of whom, it appears, had failed of re-election, threatened legal proceedings. Reports of trouble in the Western company was thereupon circulated, some going even so far as to make the statement that a receiver had been appointed. These statements are untrue, and their only basis are said to be the magnified threats from the stockholder referred to. The company's officers are in entire harmony, we are informed, and its financial and business condition is far more substantial than any time in the past, and its responsibility and reliability have considerably increased of late. The present volume of business with which it is favored, calling for work overtime in the manufacturing department, when it is taken into consideration that the company has recently increased its manufacturing capacity some 50 and upwards, will certainly tend to create confidence in the present and prospective prosperity of this vigorous concern. Its officers positively state that its financial resources, as shown by its balance sheets, much exceed in net value the total amount of its capital stock under its present capitalization, and the present success of the company is a matter of congratulation on the part of the independent telephone users of this country, whose interests it has always favored.

We have received a pamphlet, entitled "The Right to Property In An Idea," by Allen Ripley Foote, being a reprint of a lecture delivered by him before the Franklin Institute, Philadelphia, June, 1898.

An Automatic Time-Switch.

The automatic time-switch clock illustrated herewith is claimed to be the first appliance that has successfully accomplished the two-fold movement of turning on and off an electric switch at any time of the day or night at which the clock may be set. As may be seen from the illustration, the device presents a handsome appearance. The case is mounted upon a substantial base of slate upon which is placed an ordinary four pole electric switch. The wires to be controlled are cut into this switch in the ordinary manner.

The operation of the time-switch is exceedingly simple, but practical and effective. A 24-hour dial, which makes one revolution every day, revolves



An Automatic Time-Switch.

under a foxed pointer at the top. At the back of this dial are supplied two movable pointers, held in position, with sufficient friction, by a spring disk. These pointers may be set at any time of the day or night, and are foxed rigidly in position when set by pins, which engage in a row of holes parallel with the circumference of the disk. When the first pointer reaches the reading point at the top, the other end trips an alarm wire which connects with the time hook, and sets in motion the train which turns the switch. As time passes the second pointer approaches the point of reading, reaches it, and sets the train in motion again, accomplishing the second motion of the switch and turning off the lights. All the attention that this requires, after having been set for the hours desired, is winding once a week.

The time-switch is used chiefly for controlling electric lights in show windows, burglar alarms and arc light circuits. Different sizes of switches are put into the clock in accordance with the strength of the current it is required to handle. The mechanism is well made and the clock train thoroughly reliable, having been manufactured under the personal supervision of Frank E. Hubbard, a well known horological expert. The new time-switch is meeting with the most hearty welcome from all electricians for its practical utility, its money-saving qualities and its great convenience. The switch, arranged on a slate base, is said to meet all the requirements of the boards of underwriters in the different states, as well as the National Board of Underwriters. The Hubbard & Mortson factory, where this device is made, is located at 42 Union place, Hartford, Ct.

LITERARY.

"Practical Electro-Chemistry," in three volumes, by Dr. Franz Peters. Published by A. Hartleben, Vienna. Second volume.

The aim of the above publication is to collect in a well arranged volume the various electro-chemical processes which have recently been adopted in the manufacture of metals and in the treatment of ores. Little attention is paid to theoretical explanations, the chief aim of the author being to make the present volume a *vade mecum* for practical men. A special and most valuable chapter is devoted to electro analysis.

The same publishers have also recently reissued "Lighting Installations," by the well known author, von Urbanitzky. The reissue of this valuable book became necessary on account of the rapid progress which has been made in this branch of applied electricity, and great care has been taken to include in the reading matter the most recent improvement in systems and apparatus. The book contains 113 plates.

The story of the South's material progress prior to 1860, the destruction by the war and the steady advance during the last 15 years, are briefly summarized in a pamphlet, "Facts About the South," by Richard H. Edmonds, editor of the *Manufacturers' Record*, of Baltimore. To any one desirous of informing himself regarding southern industrial conditions, this pamphlet affords an epitome of facts.

Lieutenant-Colonel Andrew S. Rowan will tell, in the August number of *McClure's Magazine*, the story of the secret journey he made from Jamaica into and across Cuba, in order to learn from General Garcia what support and co-operation we were to expect from the Cuban insurgents in the war then just begun with Spain. Apart from the positive dangers that beset every step of it, it was a journey full of discomforts and difficulties, and General Miles pronounced Colonel Rowan's execution of it "an act of heroism and cool daring that has rarely been excelled in the annals of warfare." The article will be illustrated from sketches by the Cuban general, Enrique Collazo, who accompanied Rowan through the latter half of the journey.

Military and naval doings near Santiago occupy the greater part of the illustrated pages of *Collier's Weekly* for July 16. A portrait of Admiral Cervera fills the first page, the ships of his fated fleet are pictured on another, with the commanders of all of them, and facing this are the American vessels and commanders that took part in destroying the finest fleet of armored ships that ever crossed the Atlantic. The "sick bay" of the "Iowa," in which many of the wounded Spaniards were operated on, is pictured from a photograph taken on board. The double-page picture is of the great charge on July 2, by Chaffee's brigade, on El Caney—the most formidable of Santiago's outposts.

A Handsome Souvenir Catalogue.

John A. Roebling's Sons Company, Trenton, N. J., have just issued from the press of the James Kempster Printing Company, New York city, a remarkably handsome and complete catalogue of their wire rope products, bare and insulated electric wire. Regarding the catalogue the company write as follows:

"Fifty years ago Mr. John A. Roebling moved his business from Saxonburg, Pa., to Trenton, N. J. The catalogue is issued to our customers and friends, to whom it may be of interest and value, with the hope that it may mark in the minds of many people the fact that this concern has been in business for 58 years, 50 of which have been spent at the present site of the works.

"We have endeavored to illustrate, to a certain extent, the growth of our business by illustrations and descriptions of our works as they are to-day. In addition to this we have added some interesting data in regard to the large bridges with which the name of Roebling has been identified.

"The main body of the catalogue refers principally to wire rope and electrical wires. The tables have been thoroughly revised and brought up to date. They represent a great deal of labor, and offer the best information obtainable to-day on the subject of wire rope and electrical wires, from the standpoint of the consumer."

A Potential Regulator for Series Incandescent Lighting.

One of the great obstacles with which the series system of incandescent lighting has had to contend has been its want of flexibility. If the circuit is laid out for the full number of lamps which the normal voltage will operate, a means must be provided for increasing the voltage to take care of additional lamps ordinarily called for for a short time. On the other hand, if only a part of the possible number of lamps are connected in circuit, expensive or complicated arrangements are necessary to absorb the surplus voltage. To regulate the voltage, the following methods are in use :

Extra lamps are installed at the station and cut in or out of circuit as required. This method is expensive, as the power consumed in the lamps is totally lost and the lamps are worn out, while their light is wasted.

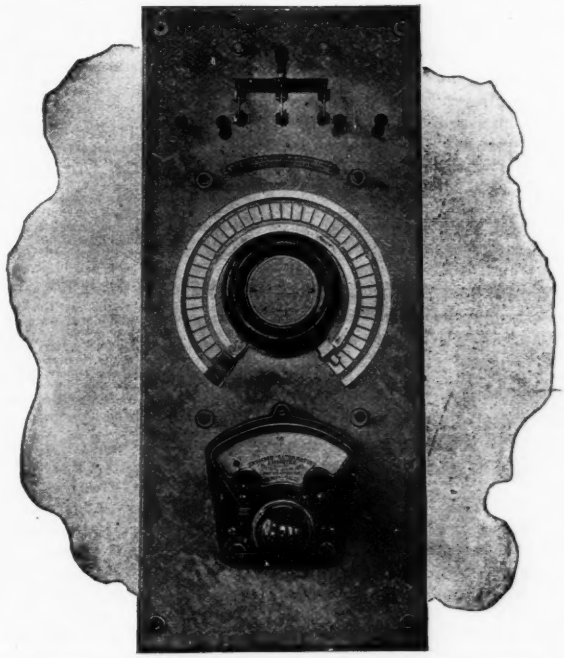
Reactive coils are placed in series with the circuit at the station. This method is also expensive, because the electro-motive force of the coil is out of phase with the voltage of the circuit, and consequently the voltage produced within the coil will be much more than the actual reduction in the voltage of the circuit.

Reactance or shunt coils are used in connection with each lamp in the circuit. Such coils can only produce approximate compensation for the lamps that may be extinguished, and are not satisfactory for compensation for the lamps permanently out of circuit for the same reason that reactive coils are not satisfactory.

For satisfactorily controlling the voltage, the General Electric Company has developed a form of potential regulator especially adapted for this work, by use of which it is claimed that the series system becomes almost as flexible as a parallel system, and the power consumed in the circuit varies directly in proportion to the number of lamps in use. A regulator panel with ammeter, switch and fuses is shown in the illustration The regulator is mounted on the back of the panel, and consists of a compensator from the secondary winding of which taps are connected to a set of contact blocks arranged in circular form on the front of the board. A hand wheel in the center of the ring of contacts operated two arms carrying brushes, which connect from the contact blocks to continuous rings on the inside and outside of the contact blocks. One of these arms is connected directly to the hand wheel, the other is connected through a bevel gear, so that the direction of rotation of one arm corresponds to that of the hand wheel, while the other moves in the opposite direction.

The compensator is so connected that whatever difference of voltage exists between the two concrete rings on the dial switch is added to or subtracted from the initial voltage of the circuit. If one arm be directly over the other, there is no difference of potential between these rings. If the hand wheel be turned to the left, a gradually increasing voltage, which will be added to that of the line, will be developed between the rings, while a gradually increasing voltage, which will be subtracted from the initial voltage, will be developed if the hand wheel be turned to the right. The ammeter below the hand wheel indicated the current in the circuit. When the number of lamps in circuit is changed, it is simply necessary to turn the hand wheel until the proper current is indicated.

The compensators are wound for the standard currents of 3, 5 and 5.5 amperes, and in either case will increase or decrease the initial voltage of 1,150 or 2,300 by 230 volts. Special regulators giving a greater range of voltage will be built, if desired.



A Potential Regulator for Series Incandescent Lighting.

Raleigh, N. C., is to have a third telephone exchange company, composed entirely of local business men. Subscribers to all three exchanges may run short of desk room.

TELEPHONE NEWS AND COMMENT.

New Orleans is soon to have the latest thing in telephone switchboards. The Western Electric Company is installing the new apparatus, and expects to have the work done by September 1.

The Pittsburgh telephone girls think their rights are being interfered with, as they are not permitted to chat with subscribers. The operators will learn in time that they can not answer calls and attend promptly to subscribers and carry on social chats. There is probably less of social talk with subscribers by telephone operators in New York city than anywhere in the world.

The Southern New England Telephone Company gained 675 subscribers for the six months ending July 1, in the state of Connecticut. Superintendent Baker announces there are 10,098 stations.

The Goshen, Ind., Telephone Company has purchased the old abandoned telegraph line that runs from Chicago to Fort Wayne, passing through the county, and will connect with the telephone lines.

The Baltimore & Hartford County Telephone Company has petitioned the Baltimore County Commissioners for the privilege of building and maintaining a telephone line from Bradshaw to Reckford.

The government's demand for electric wire is said to be delaying the work of installing the new telephone exchange of the Kinloch company in St. Louis. Here's a chance for an energetic wire manufacturer.

Arrangements are about completed whereby the Boonville, N. Y., Telephone Company, which obtained a 20-year franchise, gives up all its right, title and interest to the Central New York Telephone Company, which has done some wiring, and expects soon to have an exchange in operation. The consideration is not known, but it is reported that the Central company takes the poles and telephone apparatus which the Boonville company had purchased with the idea of starting an exchange.

The telephone war in Washington, D. C., is still quite interesting. The attorneys of the Subscribers' Association admit, however, that "many of the members are paying the bills for the quarter under protest, whether their contracts have expired or not. The circular, on the contrary, advised that, in cases where the contracts have expired, or are about to expire, the subscribers give 10 days' notice of the termination of the contract, as required by law, and then tender the amount due for the new quarter, based on the rates of the new law. If the company refuse the service or attempt to interfere in any way with the subscriber, then we propose to take them at once into court."

Contracts are being made by the Bell Telephone Company, of Missouri, with St. Louis druggists for the placing of automatic telephones in their places of business. The subscriber agrees to collect tolls to pay to the company, and, in lieu of compensation, the company agrees to pay the subscriber a commission of 10 per cent on all receipts for messages sent from each station to some other station in the cities of St. Louis or East St. Louis, connected with an exchange of the company, and also on long-distance messages. The company will attach to each set of instruments a coin-receiving device for city messages, the same as are now in operation in other cities. It is understood that the company has already placed in the neighborhood of 15 contracts, and that agents are now at work throughout the city.

AN IMPORTANT TELEPHONE DECISION.

THE CARTY BRIDGING-BELL PATENT IS SUSTAINED.

Judge Buffington, in the United States Circuit Court for the western district of Pennsylvania, has handed down the following decision in the case of Western Electric Company against Millheim Electric Telephone Company and others:

This is a bill filed by the Western Electric Company against the Millheim Electric Telephone Company, *et al.*, for alleged infringement of letters patent No. 449,106, issued March 31, 1891, to John J. Carty for telephone circuit and apparatus, and now owned by complainant. The defences are lack of novelty and patentability. These defences failing, infringement is conceded. The apparatus in question was designed primarily for use on a multiple line. Prior to this patent it was customary to connect the call-bell magnets at the several stations in series in the main-line circuit together with a normally shunted call-sending generator, and at each station to provide a switch, which, when at rest, maintained the continuity of the main circuit through all the call-bell magnets, and kept the circuit of the local transmitter battery open. When, however, the switch was changed—which was done when the receiver was taken from the hook for use—it disconnected or short-circuited the bell-magnet or generator from the line, and introduced in place thereof the telephonic transmitting and receiving instruments, and closed the local battery circuit of the former. Though this switch change at the two communicating stations removed the bell-magnets at such stations from the circuit, no such action took place at the other stations; consequently the voice current had to traverse all the other magnet helices in the line, and was much weakened, not only by the resistance of such magnets, but also by the counter electro-motive forces or inductive resistances developed in each. These were so active and energetic as to hinder conversation; yet it was necessary that all bell-magnets should be connected with the circuit, otherwise the several stations can not signal each other. It will be noted that, in this system, which is called a series circuit, the component parts are so arranged that the current must pass through all its parts, one after another. It is so styled in contradistinction to a multiple circuit, which is one having two or more of its parts so arranged that the current divides, portions of it passing through parallel paths afforded by the several parts. The two systems may be thus illustrated: When incandescent lights are connected in multiple circuit, the current passes to one terminal of each of the lamps which are connected to one side of a circuit, and then divides up, a *portion* passing through each lamp to the other side of the circuit, where all these portions are reunited. Where such lamps are connected in series, *all* the current must flow into the terminal of the first lamp and out at the other, and so on through the successive lamps.

It also appeared impossible to obtain a perfect inductive balance in a metallic telephone circuit when the bell-magnets and telephone were connected in series, and such inductive disturbances manifested themselves generally in annoyances and sometimes were so intense as to prevent conversation. Now it would seem that if, instead of the series circuit connection for both call-magnets and telephones, a multiple circuit or bridging connection, after the manner of the simplest form of incandescent lighting, was substituted, these difficulties would be avoided; but the conditions were different, since in a telephone circuit each station is both a generating and a utilizing one at the same time. Therefore, the generating currents are likely to be short-circuited by the nearest bridge connection and thus fail to reach the more distant station which it is desired to signal. The additional fact that two diverse uses are to be made of the current at the same station; viz., signaling and transmission of sound, and that they are to be used interchangeably between all the stations, renders necessary the addition of other means and factors to simple mere parallel arrangements. To overcome these difficulties the patentee suggested a simple and efficient remedy. He adopted the multiple circuit plan, and at each station placed a permanent bridge in which he seated a bell-magnet with a high coefficient of self-induction and of marked impedance. He also provided two other bridges, which were normally open and closed only when the station was in use. The generator bridge circuit was adapted to be closed while a call was being sent The third or telephone bridge circuit was open when not in use, but closed in multiple arc with its own bell-magnet and, of course, with all others in the line, when in use. When the call generator is used at a station it forms a second bridge or cross connection between the wires in parallel circuit with the permanently closed bridge circuit of its own bell and all other bells on the line. Now, the natural tendency of the ringing current would be to short-circuit through its home call-bell bridge and possibly through the nearest other call-bell bridges. This, of course, is highly undesirable, as it is necessary that all of the call-bells of the system should be operated by the call generator of each station The tendency of the current to thus short-circuit is counteracted in Carty's system by the high self-induction and impedance of the bell-magnet, which opposes the passage of the call current and effects a more even distribution of it through the bell-magnets of the system. By virtue of numerous windings of the wire in the bell-magnets, the small portion of the call current passing exerts a marked magnetizing effect on the cores, and thus secures a more spirited working of the call signal. The means employed in the device and the mode of operation is clearly stated by respondent's witness, Mr. Miller, who says:

"I am acquainted with this patent. It shows and describes a method of attaching telephone instruments in multiple between the two sides of a line, whether this line be a metallic circuit or a grounded line. The call-bells are each permanently bridged between the two sides of the line and are made of high resistance and retardation The generator at each instrument is in a separate bridge circuit which is normally open, but closed when the generator is operated. The telephonic apparatus proper is in a third bridge circuit, which, like the generator circuit, is normally open. The telephone circuit of each instrument is automatically closed when the receiver is removed from its hook for use, and this operation also closes a local circuit containing the primary of the induction coil, the local battery and the transmitter. In order that there shall not be an undue leakage of the voice currents through the permanently bridged call-bell circuits, the magnets of these call-bells are wound to a high resistance (usually 1,000 ohms) and are also constructed in such manner that they will have a high co-efficient of self-induction. When a generator at any one station is operated it is connected across the two sides of the line in parallel with all of the call-bell magnets on the line Part of the currents in this generator will therefore pass through each of the call-bell magnets on the line, thus causing them all to operate if the amount of the current generated is sufficient to accomplish this result. The successful operation of this system depends on the fact that a coil possessing a high co-efficient of self-induction will transmit with comparative ease alternating or pulsating currents of low frequency, while it will form a practical barrier to similar currents having a very high frequency. The currents generated by the calling generator at any station are of sufficiently low frequency to pass with comparative ease through the call-bell magnets arranged along the line, while the rapidly alternating voice currents impressed upon the line by the telephonic apparatus at any station will be compelled to pass over the main line to the receiving station without being materially weakened by leakage through the call-bell magnets. At the receiving station these voice currents will pass through the telephone receiver and secondary call of the induction-coil, these being connected across the line at that station by virtue of the receiver being off its hook. This path through the receiving instrument is of comparatively low resistance and retardation, and thus practically takes all of the current from the distant station."

As we have stated, the patent is assailed as lacking novelty and patentability. The grant of this patent is prima facie proof of the novelty and patentability of the invention therein disclosed, see Seymour vs. Osborne, 11 Wallace 516, and cases cited in note to 3 Robinson on Patent No. 1016, and in absence of countervailing proof to the contrary its prima facies must prevail. An examination of the many alleged anticipations does not disclose the particular combination here shown, or overcome such prima facies. If any or all of them might have suggested a combination of means and the placing of them in the relation shown in the device, it is not proved that any one so placed them. None of the elements composing the combination are in themselves claimed to be new. It is the combination of them in new relations and the securing a new and useful result thereby that constitutes the basis on which the patent rests. It goes without saying that if each element of the combination can be found in the old art, if all of them abstractedly and separately considered perform the same function they did in the old art, this will not tend to defeat the old patent if the old individual elements are here brought into novel combination with each other and their conjoined functions produce a new result. Such novelty, if the change involves patentability, constitutes ground for a valid patent. It follows, therefore, that to find in the prior art each element in isolation is not to anticipate the work of a patentee who by the inventive act first evolves combination out of isolation. In discussing the prior art, Mr. Miller, after describing the working of Carty's device as we have quoted, says, "I find the principles governing the effects of coils having a high co efficient of self-induction upon currents of high and low frequencies to be very clearly stated in various text books and patents prior to the filing of Mr. Carty's application." The critical and intelligent analysis of the prior art by Mr. Miller warrants that conclusion, but it by no means follows that knowledge of those principles is an anticipation of a combination wherein those abstract principles are used in new concrete relations, and thus made to produce new results.

Now none of these alleged anticipations show the device of Carty. Varley's English Patent, No. 1044 of 1870, simply states a principle made use of by Carty, but concededly old, and it is clear that Varley's application of that principle would not suggest to a mere improver the device of Carty. The German publication, "Das Telephon," of 1886, shows, without reference to detail of construction, two sets of telephones, one connected in series, the other in multiple. Without reference to other matters it is sufficient so say that no use of high impedance bells is shown. and beyond the principle of multiple connection it has no inherently necessary feature in common with Carty.

Attention is next called to the publication, "The Telephone," by Preece & Maier, London, 1889. Among other essential requirements to constitute such a prior publication as will defeat a patent, it is essential that it contain a description of the complete and operative art or instrument so precise and so particular that any person skilled in the art to which the invention belongs can construct and operate it without experiments and without the exercise of inventive skill. Unless a publication possesses all these characteristics it does not place the invention in the possession of the public nor defeat the claim of the reinventor to a patent. Cohn vs. United States Corset Company, 12 Blatch., 225 Fed., Case No. 2969; Seymour vs. Osborne, 11 Wallace, 516 Walker, on Patents; and the descriptions must be read in the light of the then knowledge. Betts vs. Merton, L. R. 3, Ch. Ap. 429.

Tested by these standards, it is quite clear that this publication will not and should not avail to defeat this patent. It does not disclose the device of Carty. While it speaks of the electrical difficulties as "very easily overcome by means of properly proportioned fixed resistance coils placed in the different sections of the circuit;" that "the electro-magnet inertia of the apparatus itself is here utilized," and that "it operates the receiver; it chokes the current across the bridge and so makes the working currents pass along the line," yet, when we come to examine, we find these "properly proportioned fixed resistance coils" to be a very different thing from Carty's call-bell mag-

nets. The former are only determined by tedious calculations made by technical men and must be adjusted to each individual line, while the high impedance bell of Carty's can be installed on any suitable line without reference to its length or to the number or location of stations. Moreover, the book or its drawings do not disclose how the telephone transmitting and receiving devices, or the call-current generator, or the signal-receiving apparatus, are used or adjusted with relation to each other or to the entire system. It is quite manifest, from a detailed examination of the work, that Carty's device was not given to the world by this publication, and it is equally clear, from the statements of the authors themselves in a subsequent edition, that they did not regard their system as anticipating or disclosing Carty's, if such statements were to be regarded as competent.

The other devices which are stated by respondents' witness to most nearly approach the Carty device are the divided circuit for clearing out annunciators, No. 300,144, of Scribner, and the Van Rysselberghe devices for combined telegraphic and telephonic service, patents Nos. 306,665 and 323,239. Using the method pointed out in the Scribner patent, we are unable to find any anticipation of Carty's device. Scribner's device was for effecting a connection in series between two subscribers through an exchange station, and affording means for signaling such exchange when the conversation was finished that the connection might be broken. This connection was through a clearing-out drop, and this was of as low impedance as possible. Nowhere is the use of a high-impedance bell suggested, and the proof is if it were substituted for the magnet of Scribner's device it would render talking impracticable. The bridging system of the Carty patent involved a definite and peculiar arrangement of different apparatus, operating in an original combination to effect one specific result, while the Scribner device showed normally and designedly a different arrangement of apparatus in a wholly different mode of operation to secure a result wholly different. Scribner's device was not intended for bridging a party-line system. To be forced to use the elements Scribner used in such reformed, variant and abnormal relations as are not fairly disclosed by his patent in order to approach to anything akin to likeness of Carty, tends to prove absence rather than presence of anticipation in the earlier patent. The Van Rysselberghe patents refer to a joint telephonic and telegraphic system. We do not find the Carty combination there employed. The system shows no call-signaling apparatus whatever. On this point defendants' expert says: "The telephone instrument here shown is represented by a receiver only, but there can be no question whatever but that a battery transmitter is also used, and very probably additional signaling instruments for those telephone instruments also." But to show anticipation and strike down a patent we should have something more certain than probabilities. The call-signaling apparatus of the Carty system is so vital to its use that either it or its substantial equivalent should be found in the alleged anticipation to constitute it a real anticipation. It would seem that the two systems were for different purposes, and their methods were diverse in detail. Moreover, the Van Rysselberghe system was for the simultaneous transmission of telephone voice currents and telegraphic signaling currents. The Carty system of sending call-signals could not be used in connection with Van Rysselberghe's systems. It is, therefore, apparent that in no fair sense can it be said that Carty's device was anticipated and given to the world by Van Rysselberghe's. Being, therefore, of opinion that the defences alleged have not been made good, a decree should be prepared in favor of the complainant.

Barton & Brown, of Chicago, appeared for the complainant, and the late Stanley S. Stout, of Chicago, appeared for the defendants.

Waterbury Traction Company.

At the annual meeting of the Waterbury, Ct., Traction Company the following officers were elected for the ensuing year: Directors, D. S. Plume, C. H. Newhall, Lynn, Mass.; J. S. Bartlett, Lynn, Mass.; M. P. Clough, Lynn, Mass.; J. Richard Smith, A. M. Young and George E. Terry; president, D. S. Plume; treasurer, J. Richard Smith; secretary, A. M. Young; general manager, J. E. Sewell. These are the same officers as were elected last year.

Experiments on Durability of Telegraph Poles.

On the Philadelphia, Wilmington & Baltimore Railroad, 42 telegraph poles have been set for a test of the life of different woods. The poles are divided as follows: Six chestnut poles, creosoted; six pine poles, creosoted; six chestnut poles, woodiline; six set in broken rock, six in clay, six in the ordinary manner and six to have a hole bored near the ground so they can be saturated with oil.—*Railroad Gazette.*

KIND WORDS.

THE OPINION IN MONTANA AS WELL AS ELSEWHERE.

To the Editor of Electrical Review:

The Electrical Review is all right. W. A. Rankin.

Anaconda, Mont.

The Sunset Telephone Company is putting up a new building for its exchange at Seattle. Cost, $13,000.

ELECTRIC RAILWAY NOTES.

At the annual meeting of the Biddeford, Me., and Saco Railroad Company these officers were elected: President, Esreff H. Banks; treasurer, Charles H. Prescott; directors, Esreff H. Banks, Carlos Heard, Charles H. Prescott, Joseph Gooch, Harry P. Garland.

At a meeting of the incorporators of the Orange & Passaic Valley, N. J., Railway Company, Charles A. Sterling was elected president, William Scheerer, vice president, and John H. Ely, secretary and treasurer. Mr. Ely was also appointed superintendent and general manager of the suburban trolley lines.

The Greensburg, Jeannette & Pittsburgh, Pa., Street Railway has been purchased by a Harrisburg syndicate, of which Benjamin Myers and Patrick Russ are the leading stockholders. The road will be improved, and the Greensburg & Hempfield road will be purchased, in view of making a standard gauge and extending it to Mount Pleasant.

Justice Dickey, in Brooklyn, N.Y., has appointed J. Van Sant Smith receiver of the Staten Island Rapid Transit Railroad Company, on the application of the second mortgage bondholders. The receivership follows the default of the company to pay the semi-annual interest on the second mortgage bonds, aggregating $2,500,000, July 1.

At the annual meeting of the stockholders of the Elkton & Middletown, Md., Railroad, the following directors were elected: Messrs. Rea, Massey, Green and Wood, of Philadelphia; George S. Woolly, Samuel C. Rowland and Henry H. Brady, of Cecil County. The directors elected Samuel C. Rea, president, to succeed the late Jacob Tome, and Henry Schultz, secretary.

The City Council has granted a franchise to the Los Angeles, Cal., Terminal Railway Company for an electric railway on certain streets in that city. Bids will be opened on August 15. The road will extend between Pasadena and Los Angeles along the roadbed of the present steam road of the Terminal company. A four-cent fare will be charged in the city limits.

The Sandusky, Ohio, Electric Street Railway has been sold to Judge C. S. Bentley, of Cleveland, for $60,024, two-thirds the appraised value. He represented a syndicate of Cleveland and Norwalk capitalists, and 95 per cent of the first mortgage bondholders. The line is to be improved and will probably be consolidated with the People's line, which will be purchased later by the same syndicate.

An Electrical Prayer Book.

Capt. Charles L. Albertson, of the Eleventh Police Precinct, is a well known student and collector of rare books, says the New York *Times*. His private office in the Mulberry street station house contains a lot of interesting volumes, many of which are of great intrinsic value, while others are notable because of unusual features. In an old bookstore the other day the captain came across a peculiar book bound in metal, with what seemed to be an electrical appliance at one end, which he immediately purchased. The volume proved to be a copy of the Protestant Episcopal Book of Common Prayer, translated into the language of the North American Indians in Dakota, and published in 1883 by the New York Bible and Common Prayer Book Society for the Indian Commission of the Protestant Episcopal Church, for use in the missionary jurisdiction of Niobrara.

The covers of the book had been carefully reinforced with substantial plates of nickeled brass, firmly fastened with five strong rivets on each side. At the top of each cover was an appliance for the insertion of an electric wire.

According to the story told to Captain Albertson by the seller of the book, the work was used in its present form by a missionary to the Indians in connection with an electric battery. While the unconverted brave, whose soul the missionary desired to save, held the prayer book with his hands on both covers, thus forming an electrical circuit, the latter would surreptitiously turn on a gentle current, which sent mild, but appreciable, thrills through the frame of the savage. These he believed to be manifestations of the newly-found religion.

None of the officials in the Church Missions House, the headquarters of the society which printed the work, and the center of Episcopal missionary effort in this country, to whom the book was shown, could offer any explanation as to the purpose of its metallic attachments, but all admitted that it had to do with the application of electricity to something in some form or other. Each one insisted, however, that no missionary would be guilty of any such deceit or chicanery as suggested toward the people under his spiritual care. At the Bible House, also, where all are familiar with religious works of every description, not even a guess at the solution of the mysterious object of the curious book would be hazarded.

TRANSFORMER ECONOMY.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, CHICAGO, JUNE 8, 1898, BY PROF. WINDER ELWELL GOLDSBOROUGH.

A great deal has been said and written about the static transformer of alternating currents, and yet we are only just beginning to understand this much discussed piece of apparatus. The manufacturers have made it and experimented with it, the theorists have experimented with it and disputed over it, the underwriters have disputed over it and endured it, and the central station men have endured it and made use of it to the great good and comfort of the public. No other piece of apparatus in the field of electrical engineering has been lauded higher or been the subject of greater abuse, and to all it has served a purpose.

To-day the transformer occupies a higher position than ever before, and it grows in importance as each new development in the field of applied electricity points out a new department of usefulness for it.

There has, however, been enough agitation lately on the part of manufacturers, in behalf of substituting new types of transformers for the old ones now in use, and of relegating the small transformer to the scrap heap, to cause the central station men, who are responsible for the successful operation of alternating-current generating plants, some unrest. The foundations of many of these plants were laid before the time of skilled designers of electrical machinery, and at a period when the factory motto was "cut and try." As the public demands increased, the plants developed and expanded before the practical men were amenable to "theories," and before the exact methods of the laboratory had become the daily practice of the constructing engineer. Managers see that engineers are still making mistakes, and that faulty design is still a factor in electrical development, and when they call to mind the enormous sums of money that have been spent in this country on ill-advised improvements it is not to be wondered at that they hesitate.

There is, however, a gradual change for the better in the number of the yearly contributions to the records of our electrical societies, and as these records are the expression of the best thoughts of the men who have made America famous as the land of electricity, they may be taken as signs of the times in our department of engineering activity.

We are constantly impressed with the fact that the refinements of exact scientific methods are being made the subject of every-day discussion, and that the more difficult problems of the technical side of the profession are being so well elucidated by our "practical theorists" that it is possible for all of us to enjoy a concrete appreciation of electrical science without an excessive expenditure of mental energy on the theoretical.

We are coming to a time when exact methods will be the universal rule, and when the reputation of having a high "guessing factor" will no longer be a sufficient recommendation.

These influences are noticeable in the improved electrical intelligence of our workmen, as well as of our station engineers, and I find that it extends even to the general public. Indeed, a careful record of the number of times that I am asked, "How does the little trolley wheel push the car along?" shows a yearly decrease of nearly 50 per cent.

So we see that matters adjudged to be of slight importance a few years ago are being allotted their normal position. A fault is a fault at the present day, and is not often disregarded as "too small to be appreciable." The old saying that, "if you take care of the pennies, the dollars will take care of themselves," applies just as well to electrical engineering as it does to other professions, and it is the "pennies" that I am about to deal with.

Our principal manufacturing companies freely advertise and guarantee the specific economic performance of which each and every one of the transformers that they place upon the market is capable. They severally advertise to supply us with transformers equaling in efficiency, regulation and what not any other transformer that can be found upon the market.

The manufacturing companies are unanimous in their guarantees of high-efficiency, low-core losses, negligible ageing and close regulation. If we can purchase transformers freely on these representations, with sufficient guarantee that the specifications advertised are strictly conformed to or improved upon, there is little to be desired on the part of the purchaser over and above what is offered. Any slight improvement that it shall be possible to make upon the best of the performances advertised by the competing factories will be forthcoming in consequence of the rivalries of trade, and the purchaser need only seek now for means of protecting himself against occasional faulty manufacture.

When, therefore, we consider the perfection to which this type of apparatus has been brought, in its every detail, and in sizes varying in capacity from a fraction of one to over 800 kilowatt, we have cause for congratulation.

If you have followed the design and manufacture of the commercial transformer, I think you will admit that at the present time the best of them are figured just about as close as is possible, and, in fact, we have almost reached the point beyond which any further advance in the direction of improved efficiency must be made by getting better insulating materials, requiring less space and giving this space to the iron and copper.

With a view to investigating the present status of the transformer and the ability of transformer manufacturers to meet in all cases the exacting specifications which they have laid down for themselves, I have had a number of transformers of recent design tested in the Purdue laboratories within the last year. The results of these tests are especially gratifying when gauged from the standpoint of our present commercial requirements, and to the specialist a detailed statement of the results would be interesting. In view of the fact, however, that the electrical literature of the day contains numerous matter of this kind, I will not bore you with many figures, but rather discuss the results in a general way.

With but one exception, the transformers tested have surpassed the requirements of the specifications laid down by Professor Jackson in his excellent article on transformer testing, with which we are all familiar, and, generally speaking, they have conformed fairly closely to the published guarantees of the companies submitting the transformers for test. To what extent this is true may be better appreciated if I cite one or two examples.

A 2.5 kilowatt transformer was submitted for test that was guaranteed to conform to or improve upon the following specifications: Core loss, 48 watts; regulation, 2.1 per cent, and full load efficiency, 96.1 per cent. The test of this transformer gave: Core loss, 42.19 watts; regulation, 1.9 per cent; full load efficiency, 96.2 per cent.

The showing made by this transformer is good. The core loss is 5.81 watts less than the stipulated value, and the efficiencies are in excess of the stipulated values. In this case the manufacturers more than substantiated their guarantee, and supplied a transformer that is a greater revenue producer than the specifications call for. If the core iron of this transformer can be relied upon as not materially increasing in its hysteretic loss with age, it is an easy matter to figure the money value of the excess economy that the transformer develops.

Suppose, for instance, a contract should be made for 40 of these transformers at $30 each to meet an increase in a station load of 100 kilowatts. On an all-day schedule these transformers would probably carry a commercial load equivalent to full load working for five hours. This assumption may seem to represent a better condition of service than is usually met with in practice, but it is an assumption that is fair to the manufacturer in considering the all-day efficiency. The transformers would, therefore, be working under no load for 6,935 hours and under full load for 1,825 hours per year, and under the conditions of the test would save 1,794 kilowatt hours to the station. If we figure the cost of producing this power at two cents per kilowatt hour, the saving per year would be $35.88 for the 40 transformers, or practically three per cent on the amount invested in the transformers. If this power were sold for six cents per kilowatt hour it would represent a net gain to the purchaser of $1,794 \times .06 = \$107.64$ per year more than he had any right to expect under the contract specifications.

Another 2.5 kilowatt transformer submitted for test is advertised by the makers to show a core loss of 57 watts, a quarter load efficiency of 91 per cent, a full load efficiency of 96 per cent, a regulation of two per cent, and a no load current of .1 ampere. Under test it was found to have a core loss of 63.6 watts, a quarter load efficiency of 90 per cent, a full load efficiency of 94.8, a regulation of three per cent and a no load current of .087.

Suppose we estimate the economy of transformers of this type just as we did those of the type previously considered. The 40 transformers, working on the same schedule, would waste 4,014 kilowatt hours more power than they should under the specifications advertised. At two cents per kilowatt hour the total money loss would be $80 per year, or over 6.5 per cent of the cost price of $1,200.

Many engineers may claim that the cost of checking up the performance of the transformers would more than eat up the saving affected by the small margin that these results represent, and in many cases under the present organization this would doubtless be true, but if a well advised stand was taken by the central station managers for mutual protection, the result would be markedly beneficial.

A percentage of the transformer output of each of the manufacturing firms could, for instance, be tested in some one place, where a record of the individual performance of all the transformers submitted for trial could be kept, and not only efficiency, but ageing and insulation and temperature trials could be made at a merely nominal expense.

But these examples do not cover the ground. I will cite two others.

In the case of a 15-kilowatt oil-insulated transformer, guaranteed to develop a quarter-load efficiency of 96 per cent, a full-load efficiency of 97.4 per cent, and to have a regulation of 1.77 per cent, the test showed a quarter-load efficiency of 94.5 per cent, a full-load efficiency of 96.1 per cent and a regulation of 1.6 per cent. The core loss of this transformer, which operates at 60 cycles, is 186.6 watts, and the specifications under which it was built require that the core loss should be about 150 watts.

It would take seven of these to give an output of 100 kilowatts—and they would cost not less than $115 each. The seven transformers in this case would waste 3,855 kilowatt hours in a year, which represents a financial loss of $77 in one year, over and above the loss to be expected. This approximates 10 per cent of the original cost of the transformers, and is an item that can not be neglected. If, on the other hand, this waste power could be sold at six cents per kilowatt

hour, it would represent a part of the just return on the investment contemplated when the transformers were purchased, and would mean $221 to the company.

I do not claim that the figures which I present to you cover all the items of expense that enter into the installation of 100 kilowatts—in transformers. They do not, but they do represent a phase of the question that deserves more than passing attention at a time when competition is becoming sharper and sharper.

In what I have so far said I have not touched upon the matter of the ageing of the transformer core iron. In cases where it is appreciable it only serves to aggravate the conditions and make the percentage loss greater. In the same way the cost of production and the selling price of the power both enter as important factors, as well as the cost of the transformers. All of these assumptions I have placed low and they should be regarded rather as pertinent examples of the conditions that exist in large plants. The small plants will be affected by influences of this character to a much greater extent.

I do not wish to tire you with figures, but, as I believe you will be interested in these comparisons of guaranteed and actual efficiencies, I wish to call your attention to one more case before leaving this matter. Not long ago a manufacturing company requested permission to send a one-kilowatt transformer to the university laboratories for a special test, as the transformer was of a new type and highly efficient. There was no direct guarantee in this case, but the impression was given that the transformer would develop an efficiency equal to, if not exceeding, the efficiency of any other transformer of like capacity on the market. The results of our tests indicated a core loss of 178 watts, a full load efficiency of 83.6, a quarter load efficiency of 62.4 and an all-day efficiency of only 54.5 per cent.

There are probably to-day a goodly number of these so-called "highly efficient" transformers eating up the profits of various of our lighting companies throughout the country, simply for the reason that in many cases business managers of electric light and power plants are not sufficiently alive to the importance of looking after the efficiency of the apparatus forming their equipments just as closely as they look after and check up every item of operating expense and maintenance that is necessitated by the exigencies of the service.

The use of transformers such as the one just referred to would be pitiable. It is fortunate that they do not grow to large proportions, but nevertheless they have a telling effect wherever they fall.

As regards the ageing of the modern transformer irons, I hold rather a conservative opinion at the present time. A great deal has undoubtedly been accomplished within the last few years in the way of improvement in this respect and the modern transformers that are supplied to us for testing show a wonderful gain in efficiency, due both to the lower initial core losses and to the diminished per cent of increase of these core losses with the ageing of the iron.

The general opinion seems to prevail at present to the effect that ageing is due directly to the reversal of the direction of the flow of the magnetic flux in, rather than to long continued heating of, the iron forming the cores of transformers, and this opinion is also expressed in much of the printed matter that has come into my hands.

In a recent lecture delivered by Professor Fleming, he said: "It was also discovered, some time back, by Mr. W. Mordey that prolonged slow heating of iron to only 60 degrees centigrade or 90 degrees centigrade has a marked effect on the hysteretic constant, and the result is often to increase this constant two or three times. The effect varies with the annealing of the iron, and in many cases the iron which shows the least hysteretic constant at starting, experiences the largest percentage increase of it on prolonged heating. This effect is called the magnetic ageing of the iron. Owing to the enormous use of iron for transformer purposes this ageing had now become a very important matter."

"The electrician lays no very great stress on the mechanical qualities, such as tensile strength, elasticity and so on, but he requires high permeability, small hysteretic constant and small ageing; and the iron and steel manufacturer has been able of late years to meet these new requests by producing steel of the necessary quality. Iron and steel can now be produced with a maximum permeability of 4,000 C. G. S. units, a hysteretic loss of about .15 watt pound per 100 cycles per 2,500 flux density, and of non-ageing quality. I do not mean to imply that all these qualities can be equally combined in the same sample, but that the iron or steel can be varied to suit the demand."

"Steel can be produced with a higher permeability than wrought iron for large magnetic forces, and with a superior non-ageing quality."

The fact seems to be well established that non-ageing transformer iron is a commercial possibility, but the fact remains to be demonstrated practically that material of the necessary quality can be obtained in sufficiently large quantities to supply the demands that are being made upon the manufactories.

Failure in this regard is not the fault of the builders of the transformers, and I have reason to know that there are cases in which disquiet prevails in the minds of managers as to whether or not they are getting what they are paying for. I know that the general claim is made that iron with an "inappreciable ageing effect" is used, and I do not wish to go on record as claiming that it is not used, but what I do wish to point out is that there are transformers being placed on the market to-day that do not contain non-ageing iron. From a large transformer company I have received notice that "at the present time we have no non-ageing iron which will fulfill our specifications of core loss; that which we have on hand will give a core loss of from 20 per cent to 25 per cent greater than the amount stated in our specifications." At the present time, therefore, it is needful to make just as careful tests for ageing as for efficiency or for insulation, in spite of the fact that the former take a longer time, and are therefore relatively more expensive to make.

During the last three months six transformers of different types have been subjected to more carefully conducted ageing tests in our laboratories. The completed report on these tests has come to me within the last few days, and I can give you a résumé of the results.

The core losses of transformers A and B were high to begin with, the first being 72 watts and the latter 83 watts. The per cent increase in the core loss of these two transformers does not, however, seem to be as great as the per cent increase in the core losses of transformers C and D, that are of more recent manufacture, and that showed initial core losses of 31.5 and 37 watts, respectively.

Transformers B and D are of 1.5 kilowatt capacity, and transformer A and C of 2.5 kilowatt capacity. An increase of from five to ten per cent is shown in all the transformers.

To get an idea of what this means, suppose we consider the effect upon the economy of the 2.5 kilowatt transformers, considered in the second case discussed above of a 10 per cent increase in the core loss. It will add $1.11 per year to the cost of operating each transformer at two cents per kilowatt hour, or $44.04 for the total number.

This represents an additional gain of 3.7 per cent per year on the investment in three months, or a possible percentage loss on the investment of 14.8 per cent after the first year on the supposition of a uniform increase in the core loss.

These figures are not startling in any way, they are too small for that, but they are matters of fact to be taken into consideration when making investments. The opinions that I am voicing regarding the ageing of modern transformer irons are conservative, as I believe the transformers built to-day will show a marked improvement upon the performance of transformers built even as late as one year ago. As far as the ageing tests that we have made go to throw light upon the subject, I am inclined to believe that the ageing problem has as yet not been solved, as none of the transformers tested have met the requirements of the specifications under which they were submitted, and some have fallen very far short of it. All of the transformers tested were new except transformers A, which, at the time these tests began, had a core loss already increased to 13 per cent above its initial value. Transformer A was built about two years ago.

The ageing of transformer iron does not increase at a constant rate with the time. The rate of increase diminishes as the service continues, but the increase may go on indefinitely. Until the use of non-ageing iron becomes more generally possible than at present, it is probable that it will pay to replace the majority of the transformers placed on the market by new ones every few years.

It is our present intention to inaugurate next Fall a series of one year ageing tests, under continuous full load conditions, of a representative number of transformers that will be built during the present Summer by the manufacturing companies who are interested in having these points thoroughly ventilated, and I trust to be able to publish a record of fine performance in this respect at the time of the completion of the tests.

The correct insulation of transformers is another important point that should be considered by the central station manager. Like many of the problems with which we have to deal in the effort to make the transformer a commercial success, this one seems to be subject to a wide variety of opinion. The oil insulation of transformers has deservedly come into great favor, and, where care is taken in the selection of the oils used and in the proper design of the transformer case, high protection is secured. Oil insulation, under all circumstances, does not, however, secure the purchaser the protection which he feels he is paying for. The claims that are usually made for the superiority of oil insulation, to wit: that it serves to preserve the insulation from oxidization, reinforces the resistance of the insulation to puncture, reinsulates punctures after the passage of the discharge and facilitates the diffusion of the energy liberated as heat in the core and the coils, can, in general, be readily substantiated.

My experience, however, is that these statements must be regarded as having only a relative bearing upon the subject. Under certain circumstances the insulating value of an oil will be very materially impaired. We are told that transformers will last indefinitely when insulated with oil, whereas without oil the insulation will be so deteriorated after five or ten years that the transformers should be replaced, and it may therefore be a matter of surprise that the insulating qualities of the oil itself are ever seriously diminished. As a matter of fact, experiment shows that the insulating properties of the oils commonly used in transformers are increased as their temperatures are raised up to about 110 degrees centigrade, and that if allowed to cool they will not lose their augmented power of resisting a disruptive discharge. This much might be said in favor of oil insulation, in view of this two or three-fold gain in insulating power, were it not for the fact that a continued heating of the oil for any considerable length of time changes the oil to such an extent that, on being cooled, its break-down value will be

only about one-fifth of its original value. And, therefore, an oil-insulated transformer that will stand an insulation test of 10,000 volts when new, may break down under a pressure of 2,000 volts after having been in continuous service for a considerable time. Conditions such as will produce a result of this character are not likely to occur in the case of modern transformers, as the increase in the temperature of even the poorest transformers rarely exceeds 70 degrees centigrade. I have, however, met with cases in which excessive heating has resulted when the transformers were kept continuously in service, and I have also in mind a case in which a good modern transformer was so situated above a tin roof and in a position where it was protected from any breeze that might be stirring, that, when the sun played upon it, its temperature reached perfectly distressing values.

What I have said will serve as a hint of how not to handle a transformer, and the importance of selecting proper places for the location of transformers.

If you will look carefully into the matter you will find that not all of the burnouts are due to faulty construction on the part of the manufacturer. It is my experience that the contractor has been in fault in a fair proportion of the cases in which the transformer and service installation has suffered.

For all commercial purposes the best oils will be found to give thoroughly satisfactory results and retain their insulating properties unimpaired so long as the maximum temperature of the oil does not exceed 60 or 70 degrees centigrade. In making a station test of a transformer, if the rise in the temperature of the windings, as measured by the increase of resistance method, does not exceed 50 degrees centigrade, after a 10 hours' run at full load, the transformer may be passed as satisfactory in this respect.

(To be continued.)

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

STATESVILLE, N. C.—The Statesville Telephone Exchange has under consideration the establishment of long distance lines from this place to several southern towns.

FLORENCE, S. C.—The Florence & Allison Telephone Company has been incorporated, to conduct a general telephone business between this place and Allison, S. C.; capital stock, $1,000.

GREENVILLE, S. C. — The Piedmont Telephone and Telegraph Company has been organized by George A. Browning, president of the Greenville Home Telephone Company and associates, for the purpose of establishing exchanges at several southern points.

SHELBYVILLE, ILL.—The Shelby County Telephone Company, of this place, certified to an increase in the number of its directors from three to five.

SHREVEPORT, LA.—The Red River Telephone Company, Limited, has been incorporated with W. A. Martin, president; J. M. Sentell, vice-president; R. T. Glassell, secretary and treasurer; for the purpose of constructing a telephone system from Briarfield to this place; capital stock, $800.

MAGNOLIA, MISS.—The Citizens' Telephone Company has been incorporated by J. E. Wolfe, T. B. Lampton, J. E. Norwood, P. H. Enochs, W. E. Payne and others, for the establishment of a telephone system.

ASHEVILLE, N. C.—W. B. Williamson, president Board of Trade, may be addressed concerning establishment of telephone system.

ALVIN, TEX.—The Alvin & Angleton Telephone Company has been incorporated by O. S. Cummings, A. J. Birchfield, F. J. Bush, A. W. Wilkerson and W. A. Leonard, for the operation of telephone lines in Brazoria County; capital stock, $2,000.

CLEVELAND, OHIO — The Home Telephone Company has been incorporated with H. A. Everett, president; E. W. Moore, vice-president; John Sherman, treasurer; F. R. Price, secretary; capital stock, $500,000.

BROOKVILLE, KY. — The Brookville Railroad Company has begun the erection of a telephone line from this place to connect with the Western Union at Wellsburg.

KEENE, N. H.—The New England Telephone Company are about to put up a copper circuit from Boston to Burlington, Vt, via Nashua and Keene, to accommodate their Montreal business, which has been increasing rapidly of late.

KEELER'S BAY, VT.—The telephone line is to be extended to North Hero and Adams Landing.

MINNEAPOLIS, MINN.—The Northwestern Telephone Exchange Company has decided to put in an exchange at Merriam Park, and the station will be in operation in about six weeks. The exchange will be located near the intersection of Prior and St. Anthony avenues.

MIDVALE, MD.—The Maryland Telephone Line will be extended to this place and Edgemont. Work has also commenced on the line to Martinsburg, W. Va.

HAMMONDSPORT, N. Y.—The New York & Pennsylvania Telephone and Telegraph Company is rebuilding its line from this place to Gibson. The metallic circuit will be used, and the line built straight along the lake through to Gibson, with branches running to the villages of Pulteney and South Pulteney.

ATCHISON, KAS.—The City Council has passed an ordinance granting a franchise to a new telephone company to put in an exchange in opposition to the Bell company.

LONDON, ONT. — The People's Telephone Company has been incorporated, and is seeking a franchise. R. H. Evans and Henry Walters, of Detroit, are among the charter members.

UTICA, N. Y.—A telephone line is to be constructed this season to Thousand Island Park and Fine View. Nearly all the poles are set, and it is expected that it will be in working order within two or three weeks.

New Incorporations.

SACRAMENTO, CAL.—The Electro-Magnetic Weighing Scale Company has been incorporated with the following directors: H. G. Smith, W. P. Owens, F. B. Smith, F. F. Smith and Edward Hanak, for the purpose of manufacturing, buying and selling automatic electro-magnetic weighing scales, etc.; capital stock is $1,000,000, and the number of shares 20,000, of the par value of $50 each.

CHICAGO, ILL.—Crowdus Company has been incorporated by Thomas B. McGregor, Frank G Howser and Belle W. Barry, for the purpose of manufacturing electrical devices; capital stock, $25,000.

SPRINGFIELD, ILL. — The Colby Electrical Manufacturing Company, of Chicago, name changed to the Chicago Non-Refillable Bottle Stopper Company.

CHICAGO, ILL.—The Ballard Electric Company, name changed to Wells-Goodhue Company.

NEW YORK, N. Y.—The Hadaway Electric Heating and Engineering Company has been incorporated with the following directors: Harold S. Mackaye, Harcourt Brigham, Nelson Heiss, New York; capital stock, $50,000.

PARIS, TEX. — The Paris Light and Power Company has been incorporated by D. H. Scott, B. J. Baldwin, Jr., T. J. Record and John A. Porter, for the purpose of manufacturing gas and electricity for light, heat and power; capital stock, $60,000.

LANSING, MICH. — The Western Electric Company has been incorporated at Detroit, with a capital stock of $1,000,000.

CLEVELAND, OHIO — The International Electrical Company has been incorporated by A. W. Mayers, E. H. Shaw, W. R. Studebaker, W. S. Hale and Charles Seaton, to manufacture and deal in electrical appliances on $10,000 capital.

BERWICK, ME.—The National Arc Lamp Company has been organized for the purpose of manufacturing and dealing in electrical and other mechanical devices, with $10,000 capital stock. The officers are: President, Charles C. Barton, of Framingham, Mass.; treasurer, John R. Hosmer, of Boston, Mass.

Electric Light and Power.

BALTIMORE, MD.—The Tuxedo & Embla Park Water and Electric Light Company has been incorporated by Granville O. Wilson, Henry A. Leonard, John H. Neudecker, Frederick E. Wilson and William F. Smith, with a capital stock of $25,000, for the purpose of supplying Embla Park and Tuxedo with water and, ultimately, with electric lights.

SPARTANBURG, S. C.—W. C. Whitner & Company, Anderson, S. C., are the contractors for an electric plant in this city.

BEAVER FALLS, PA. — Martsolf Brothers, of this place, are putting in an electric light plant in their large block on Seventh avenue.

BEADLING, PA.—Beadling Brothers, of this place, are erecting a new electric plant.

TERRE HAUTE, IND.—The Vigo Light and Power Company, to furnish electric light to this place, has been incorporated; capital stock, $50,000. The incorporators are W. R. McKeen, Herman Hulman, James, A J. and J. A. Crawford.

DUNDEE, N. Y.—The electric light plant at Ovid is being rebuilt and supplied with new and improved machinery.

New Electric Railways.

PEEKSKILL, N. Y.—The Peekskill Traction Company has been granted a franchise by the highway commissioners of Cortlandt Township to operate a trolley road in the village limits.

CHESTER, ILL.—A company is being organized in this county with a capital stock of $100,000 to build an electric railway from Belleville, through Smithton, Hecker Red Bud, Ruma, Evansville and Ellis Grove to Chester. The road will be an extension of the electric line already completed from East St. Louis to Belleville.

EAST ST. LOUIS, ILL.—The East St. Louis & Collinsville Electric Railroad Company has been incorporated; capital stock, $2,500; incorporators, William Ortgrier, T. T. Ramey and W. E. Hadley.

Business Troubles

CINCINNATI, OHIO — Julius G. Sarran, doing business as Sarran & Company, gas and electric fixtures, has made an assignment; estimated assets, $20,000; liabilities, $15,000; preferences, $11,000.

CLEVELAND, OHIO—The Corman Company, assayers, refiners and dealers in electrical supplies, filed a deed of assignment, A. R. Manning, Jr., assignee. The liabilities and assets are stated as $10,000 each.

The plant of the Cincinnati, Ohio, Edison Company was destroyed by fire a few days ago. The fire is said to have originated from the explosion of a boiler. No estimate has as yet been placed on the loss.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED JULY 19, 1898.

607,451 Electro-magnetic motor; A. B. McMillan, New York, N. Y.—Consists of a motor having an armature and field-magnet, a secondary armature acted upon inductively by a rotating field of force produced by the rotating element of the motor.

607,469 Box-filling machine; F. H. Richards, Hartford, Ct.

607,473 Recording apparatus for weighing machines; F. H. Richards, Hartford, Ct.

607,476 Weighing machine; F. H. Richards, Hartford, Ct.

607,506 Apparatus for producing alkali metals from their chlorids; Paul Danckwardt, New York, N. Y.

607,540 Electrical resistance; H. S. Chase, Boston, Mass.—Consists of a resistance loop having its ends secured to terminal leads which are bound together, but capable of easy separation, and an enamel envelope surrounding and insulating the resistance loop.

607,550 Actuating mechanism for station indicators; D. W. Porteous, London, England.

607,589 Electric arc lamp; John H. J. Haines, New York, N. Y.—Consists of a detached tilting clutch freely movable about its axis and provided on its inner periphery with rotary friction devices.

607,593 Dynamo-electric machine; W. B. Sayers, Glasgow, Scotland.

607,608 Rheostat; M. J. Shiels, Westfield, N. J.

607,609 Field magnet for electric machines; S. H. Short, Cleveland, Ohio—Consists of cores or supports for the field magnet windings, each comprising a series of plates or laminations, whereby the continuity of the end surface of such cores is broken, with a ring of magnetic material arranged to surround the armature end of each of said cores or supports.

607,610, 607,611 Electric railway system; S. H. Short, Cleveland, Ohio—A roadbed, a box or casing arranged therein and having an opening in the top thereof, and a surface contact of smaller size than said opening, and arranged to project therethrough with a circuit for said contact, and means carried by the car for completing the circuit through said contact.

607,612 Trolley base; H. G. Taylor, Montreal, Canada.

607,617 Regulating switch for electric circuits; H. P. Davis, Pittsburgh, Pa.—Two sets of annularly arranged stationary contacts, a pivoted co-operating contact arm for each set of stationary contacts, a single pivoted operating lever having a limited reciprocatory movement, and means intermediate the lever and each contact arm whereby said arms may be oppositely moved from one stationary contact to the next through the entire set in either direction.

607,621 System of electrical distribution; B. G. Lamme, Pittsburgh, Pa.

607,638 Electric line-switch; A. B. Du Pont, Detroit, Mich.—Consists of a pivoted tongue, a magnet and spring for controlling the position of the tongue, a ribbed section connected through the magnet coil with the main conductor at each end of the tongue, and roofs protecting the tongue, ribbed sections and magnet.

607,672 Controller; T. von Zweibergk, Cleveland, Ohio.

607,697 Electric railroad; C. A. Myers, Atlantic City, N. J.—A track rail, comprising two sections spaced apart and forming opposite walls of a conduit, the tread of one section being below the plane of the other section tread, an insulating material arranged in a groove in the under side of a section tread, and a conductor for electricity supported by said insulating material.

607,714 Electric stop-motion for looms; A. Stephens, Guadalajara, Mex.

607,715 Voltmeter; J. F. Stevens, Philadelphia, Pa.

607,737 Dynamo-electric machine; A. G. Eigner, St Petersburg, Russia—A field magnet for dynamo electric machines, being formed of separate complemental members joined together, each of said members having projections co-operating with the projections of another member to form complete polar projections, said members being separated to form slots in said polar projections.

607,760 Circuit arrangement for electrical apparatus; J. Miesler, Vienna, Austria-Hungary.

607,891 Long-distance telephone; P. de Kilduchevcky, London, England.

TRADE NOTES.

J. Jones & Son, New York, report the receipt of a large foreign order for goods of their manufacture, which will keep their factory busy for some weeks. This firm has recently moved to much larger quarters to more easily handle its increasing business.

"The Long and Short of it" may be aptly applied to the new Western Electric long-burning enclosed arc lamp, recently described and illustrated in these columns. It is a very short lamp which burns for a very long time; both qualities very much appreciated by the station manager and arc lamp user. Where simplicity of construction and elegant appearance are added, as in this case, the lamp can not fail to become a favorite.

When a concern like the Cutler-Hammer Manufacturing Company, Chicago, has to call in some of its salesmen because they are selling too many goods, it must speak well for the high quality of the apparatus made by the company. Fortunately, a case of this kind can be easily remedied by the necessary increase in manufacturing facilities, and the company will not be slow in meeting all demands for its rheostats and other specialties.

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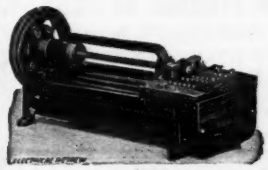
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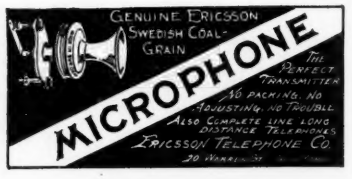

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